

Benefits of Limonene

Benefits of limonene include fighting cancer, preventing heart attacks, lowering cholesterol, controlling weight, reduces stress, anxiety and depression, dissolves gallstones, and helps relieve heartburn.

Limonene comes in two forms D-limonene and L-limonene. While these have the same chemical formula, they differ in their structure. D-limonene (1-methyl-4-(1-methylethenyl) cyclohexane), which we simply call limonene, is a major compound in several essential oils made from citrus fruit peels. These oils are:

- [Orange](#)
- Lemon
- Mandarin
- [Lime](#)
- [Grapefruit](#)

Because of its lemony aroma it is widely used in foods, perfumes, soaps, juices, ice cream, candy and chewing gum. The US government recognized it as a generally recognized as safe (GRAS) flavoring agent.

Some medicinal benefits of limonene include:

- As a solvent of cholesterol it helps dissolve cholesterol-containing gallstones.
- It neutralized gastric acid and so helps relieve heartburn and gastroesophageal reflux disorder (GERD).
- It supports healthy peristalsis to help keep your bowel movements regular.
- It has a chemopreventive activity against various cancers.

Limonene Has Well Researched Health Benefits

Many studies have been done to determine the health effects of limonene. Here are a few studies and their findings.

Benefits of Limonene in the Remission of Cancer Tumors

[Researchers](#) perform three experiments on rats. In the first experiment they induced cancer tumors in rats in two different ways (with either DMBA or NMU). The rats were handled every two weeks to detect any tumor growth. When a tumor was felt, the rats were assigned to either a normal diet or a normal diet with 10% limonene. The rats with a DMBA-induced tumor who were on the limonene diet had a 68% remission rate while normal-diet rats had only a 23% remission rate. The limonene-fed rats with an NMU-induced tumor experienced a 96% remission rate while normal diet rats had a 58% remission rate. Both differences in remission rates were highly significant ($p < 0.001$).

The second experiment was designed to determine the minimum dose required for a significant remission rate. In this experiment 200 rats were given DMBA. When a tumor was felt the rats were assigned to a variable dose diet ranging from 0%, 2.5%, 5.0%, 7.5% or 10% limonene. The results showed that a highly significant remission rate ($p < 0.001$) required the 7.5% or 10% concentration of limonene.

In the third experiment was a large tumor study. While small tumors often have a good spontaneous remission rate, large tumors have a much lower spontaneous remission rate. Here, the rats were given either DMBA or NMU to induce tumors. When the tumors grew large (at least 10 mm) the rats were randomly assigned to either a normal or a 10% limonene diet. The results for the limonene-diet rats showed a complete remission of tumors in 53% of the DMBA tumor rats and a 79% remission

rate in the NMU-tumor rats. None of the normal diet rats showed spontaneous remission of tumors.

These experiments show the benefits of limonene for reducing some cancer tumors. Limonene at levels which are not toxic had significant effects on these mammary carcinomas. And, limonene caused the remission of large tumors for which spontaneous remission did not occur. While the limonene-diets caused faster remission of small tumors than was seen with spontaneous remission, when limonene was withdrawn some of the tumors reappeared.

Benefits of Limonene in Hypertension

[Researchers](#) wanted to determine the effects of various diets (including supplementation with limonene) on blood pressure, triglycerides, cholesterol and other blood components. To do this, they prepared six diet plans to be fed to rats:

- **Standard:** Standard rat pellet diet for 8 weeks
- **Standard+Limonene:** Standard rat pellet diet for 4 weeks then rat pellets supplemented with limonene for 4 weeks
- **HFD:** High fat diet for 8 weeks
- **HFD+L-NAME:** High fat diet supplemented with L-NAME (N ω -nitro-L-arginine methyl ester) for 8 weeks
- **HFD+Limonene:** High fat diet for 9 weeks, then supplemented with limonene for the last 4 weeks
- **HFD+L-NAME+Limonene:** High fat diet supplemented with L-NAME for 8 weeks supplemented with limonene for the last 4 weeks.

The major results allow us to reach a number of statistically significant conclusions.

- **Weight Gain.** While all rats continued to grow and gain weight, the rats on the HFD gained significantly more weight than the rats on a standard diet. In addition, the rats on the HFD not supplemented with limonene gained significantly more weight than the rats on the

HFD supplemented with limonene.

- **Blood Pressure.** The rats with the lowest blood pressure were those on the standard diet supplemented with limonene. Just a bit higher were the rats on the standard diet alone. Only slightly higher were the rats on the HFD supplemented with limonene. All these rats had blood pressures significantly lower than the rats fed the HFD alone. The rats with the highest blood pressures were those fed the HFD+L-NAME diet.
- **Heart Rate.** The heart rates of rats fed the HFD and the HFD+L-NAME were significantly higher than the other rats.
- **Triglycerides.** As would be expected, rats fed the HFD and the HFD+L-NAME diets had the highest level of triglycerides. But rats consuming these diets supplemented with limonene were significantly lower and very near that of the control group.

These results indicate that limonene has significant effects on weight, blood pressure, heart rate and triglycerides.

Research on the Benefits of Limonene

Various studies have taken place or are planned to investigate limonene. Here are just a few:

- [Behavioral Pharmacology of THC and D-limonene](#). Subjects will test THC alone, limonene alone, THC and limonene together, or placebo.
- [Human Breast Tissue Bioavailability of Topically Applied Limonene](#). The purpose is to determine the safety and breast tissue bioavailability of limonene following massage application of limonene containing massage oil to the breast.
- [AV2 Antiviral Spray Versus Placebo in Human Papillomavirus Cervix Infections](#). The study will try to show that, by a one-time topical spray on the cervix, AV2-DM (90% olive oil and 10% d-limonene) is an

effective antiviral in reducing on short term (3 months) the human papillomavirus (HPV) infection.

References

- [D-Limonene: Safety and Clinical Applications](#) in *Alternative Medicine Review*
- [Limonene-induced Regression of Mammary Carcinomas](#) in the journal *Cancer Research*
- [d-limonene attenuates blood pressure and improves the lipid and antioxidant status in high fat diet and L-NAME treated rats](#) as reported in the *Journal of Pharmaceutical Sciences and Research*