

# These Herbs Can Help Suppress Tumor Development

Analysis by [Dr. Joseph Mercola](#) ✓ Fact Checked

## STORY AT-A-GLANCE

- › Plant scientists from Purdue University in West Lafayette, Indiana, identified compounds in oregano and thyme that suppress tumor development and mapped the molecular biosynthetic pathway, or "recipe," to determine the steps to reproduce the compounds in the lab
- › Herbal medicine has played an important role in nearly every global culture; herbs have been used to fight viral infections and cancer, to lower blood pressure and to alleviate the side effects of chemotherapy
- › The antitheses of whole foods such as herbs are highly processed packaged foods that raise the risk of obesity and chronic disease, and ultimately increase the risk of early death

Plant scientists from Purdue University in West Lafayette, Indiana, took the next step in discovering how compounds found in Mediterranean spices, including thyme and oregano, may be developed into pharmaceutical products that could help suppress tumor development.

The research was published in December 2021 in the Proceedings of the National Academy of Sciences.<sup>1</sup> The researchers looked at the monoterpene alcohols found in thyme, oregano and other herbs in the Lamiaceae family.

Most members of the family are annual or perennial herbs with fragrant volatile oils. Other herbs in the family include rosemary, basil, catnip and sage.<sup>2</sup> According to the

American Cancer Society,<sup>3</sup> experts estimated 1.9 million new cases in 2021 and 608,570 deaths in the same year.

Many of the risk factors for cancer are modifiable.<sup>4</sup> This means that you have control over your exposure to risk factors that may increase your potential for cancer. Risk factors for cancer include a poor diet, physical inactivity, drinking alcohol, excess body weight and cigarette smoke.

Researchers in the featured study were interested in identifying the compounds and determining the biosynthesis in thyme, oregano and other herbs in the Lamiaceae family that may have an impact on suppressing tumor growth. The research follows past studies<sup>5</sup> that have demonstrated herbs and spices play a role in the prevention and treatment of cancer.

## **Plant Scientists Found a Recipe for Herbal Compound**

The distinctive flavors in oregano and thyme are from thymol, carvacrol and thymohydroquinone. Thymol is the primary extract from thyme.<sup>6</sup> The herb is often used in tea to treat colds and coughs, valued for the secretolytic, antispasmodic and antibacterial properties. Oregano has higher levels of carvacrol. The compounds are closely related and produced in the plant through multiple stages.

Scientists were intrigued by the anticancer properties of thymohydroquinone. In a collaborative effort with two other universities<sup>7</sup> they were able to determine how the precursors, thymol and carvacrol, were formed.

The researchers determined that these findings alter past data of how scientists had believed thymol and carvacrol are formed.<sup>8</sup> The study also identified the enzymes involved in the production of the monoterpenes, which may provide further research targets for metabolically engineering terpenes considered high value in plants.<sup>9</sup>

Having determined the pathway used to create these compounds, scientists now believe they can selectively breed plants to produce higher amounts, or they may incorporate production into other microorganisms, like yeast. Using this method to harvest the

compounds would require fermentation. To pursue the next step, the team secured a \$5 million grant from the National Science Foundation.<sup>10</sup>

In other research, scientists have found that the overall incidence of cancer is lower in countries eating Mediterranean diets, which they believe correlates with reduced risk. Some identified aspects of the diet that reduce risk are a higher consumption of fruits and vegetables and lower consumption of processed meat.<sup>11</sup>

The scientists from Purdue University sought to identify the compounds in the Mediterranean herbs that could suppress tumor development and determine how they might be used in pharmaceutical drug treatments. The study was designed to map the molecular biosynthetic pathway, or "recipe," and identify the steps that might be needed to reproduce the compounds in the lab.

To identify the pathway, the researchers used RNA sequencing and screened more than 80,000 genes from the plant samples. They determined genes the plants used to produce thymohydroquinone, and from this and past research, they identified the molecular map. One of the researchers, Natalia Dudareva from the department of chemistry, commented in a press release:<sup>12</sup>

*"These plants contain important compounds, but the amount is very low and extraction won't be enough. By understanding how these compounds are formed, we open a path to engineering plants with higher levels of them or to synthesizing the compounds in microorganisms for medical use.*

*It is an amazing time for plant science right now. We have tools that are faster, cheaper, and provide much more insight. It is like looking inside the cell; it is almost unbelievable."*

## **Herbs Suppress Tumor Growth and Development**

Herbal medicine has played an important role in nearly every area of the world. It was practiced in ancient cultures and has seen a resurgence in popularity in Western culture.

Natural products isolated from herbs used in Chinese medicine have also demonstrated apoptosis, angiogenesis suppression and retarded metastasis.

One paper<sup>13</sup> reviewed the therapeutic potential of compounds isolated from these herbs, including flavonoids, terpenes and quinones. One of the terpenes, artemisinin, which is derived from sweet wormwood, was found to have excellent anticancer potential.

More recently, this compound has shown some efficacy against SARS-CoV-2, the virus that causes COVID-19.<sup>14</sup> Chinese herbal medicines have also been used to alleviate the side effects of chemotherapy. One Cochrane review of the literature<sup>15</sup> found that despite the low quality of the study, the results suggested that decoctions of Huangqi, aka astragalus, could decrease the side effects of chemotherapy.

Two papers were published in 2021<sup>16,17</sup> that evaluated the effect of carvacrol and thymol against cancer cells. In one literature review<sup>18</sup> of studies published from 2003 to 2021, the results revealed that both carvacrol and thymol have antitumor and antiproliferative activity.

A second paper<sup>19</sup> evaluated the effect of carvacrol and thymol against acute myeloid leukemia and found a combination of the compounds induced tumor cell death with low toxicity to normal cells.

Another lab study published in 2020,<sup>20</sup> found that thymol and carvacrol induced apoptosis in ovarian cancer cells in a time- and dose-dependent manner. The combination of monoterpenes also demonstrated antiproliferative properties. The cell line used in this lab study was more sensitive to thymol than to carvacrol.

In addition to suppression of tumor cell growth or development, the anti-inflammatory effects of monoterpenes may also help reduce the risks from cancer. Inflammation has been linked to the progression of cancer cells, so targeting chronic inflammation may be an effective strategy for prevention and treatment.<sup>21</sup>

One paper published in the *Frontiers in Pharmacology*,<sup>22</sup> detailed the pharmacological features of thymol, including anti-inflammatory, antispasmodic, free radical scavenging,

and antitumor, and antifungal properties.

## **Processed Foods Lead to Cancer and Early Death**

The antitheses of healthy, whole foods like herbs are highly processed packaged foods. Studies<sup>23,24,25,26</sup> have repeatedly demonstrated that when people switch from a traditional whole food diet to processed foods (which are high in refined flour, processed sugar and harmful vegetable oils), disease inevitably follows.

Society is moving toward processed food instead of whole food as food manufacturers pour more money into advertising the "taste" and "convenience" of their products.<sup>27</sup> Nearly 80% of this is spent on promoting sugary drinks, unhealthy snacks and fast food. Advertising spent on dangerous food products dwarfs the \$1 billion spent on health promotion and prevention for all chronic diseases by the CDC.

Most Americans' diets consist of 57.9% ultraprocessed food,<sup>28</sup> which are products at the far end of the spectrum of processed foods, much like what you would find at a gas station or convenience store. In general, the developed world eats significant amounts of processed foods, and the trend of chronic disease reveals the inherent folly of this move.

In 2013 it was estimated that as much as 40% of health care dollars in the U.S. are spent on diseases directly related to the overconsumption of sugar<sup>29</sup> In the U.S. more than \$1 trillion is spent on treating sugar and junk food-related diseases each year – and it's almost certainly gone higher in the 10 years since that estimate was made. The difference in the amount of sugar between foods that are ultraprocessed and minimally processed is dramatic.

Research<sup>30</sup> has demonstrated that 21.1% of calories in ultraprocessed foods come from sugar, while unprocessed foods contain no refined or added sugar. In a cross-sectional study<sup>31</sup> of 9,317 participants, researchers concluded that "Decreasing the consumption of ultraprocessed foods could be an effective way of reducing the excessive intake of added sugars in the USA."

One study<sup>32</sup> followed 44,000 people for seven years and found that eating ultraprocessed foods raises your risk of early death. This link remained even after taking confounding factors such as smoking, obesity and low educational background into account. As you'd expect, the primary factors driving the increased death rate were chronic diseases such as heart disease and cancer.

As the featured study illustrates, your diet is a key factor in determining your health and longevity. Another study<sup>33</sup> in 2017 supported past research, finding a poor diet is linked to an increased risk of cardiometabolic mortality, or death from heart disease, stroke or Type 2 diabetes.

In my view, eating a diet consisting of 90 percent real food and only 10 percent or less of processed foods is an achievable goal for most that could make a significant difference in your weight and overall health.

## **Herbs Help Fight Respiratory Viruses, High BP and More**

Traditional herbal medicine has also used herbs to help normalize blood pressure. High blood pressure (BP) increases the risk of heart attack, kidney disease, vision loss, stroke and damaged blood vessels.<sup>34</sup>

One research team<sup>35</sup> recruited 63 people with known risk factors for heart disease for a controlled feeding study. The researchers measured the effect of eating varying levels of herbs and spices on blood pressure.

The blend of 24 herbs and spices included basil, thyme, cinnamon and turmeric. They found generously seasoning your food was linked with lower blood pressure measurements after just four weeks. Penny M. Kris-Etherton, professor of nutritional sciences at Penn State Evan Pugh University, said in a press release:<sup>36</sup>

*"I think it's really significant that participants consumed an average American diet throughout the study and we still found these results. We didn't decrease sodium, we didn't increase fruits and vegetables, we just added herbs and*

*spices. It begs the next question that if we did alter the diet in these ways, how much better would the results be?"*

Tested on its own, thyme has also been found to reduce blood pressure.<sup>37</sup> Thyme is also one of the top antivirals and immunostimulant herbs in a review of the best herbs for colds, flu and COVID-19.<sup>38</sup>

Research published in early 2021 investigated the use of thyme against COVID-19.<sup>39</sup> The researchers engaged 83 patients with COVID-19. They gave the participants a questionnaire about their symptoms before receiving the thyme and one week afterward. After just one week, those taking the thyme had a reduction in fever, dizziness, cough, shortness of breath, headache, muscular pain, anorexia, weakness, chest wall pain and fatigue, suggesting:<sup>40</sup>

*"Thyme plant which has high antioxidant properties, strengthens the immune system, and induces the antiviral effect could reduce the symptoms of coronavirus; therefore, it is recommended for reducing the symptoms of COVID-19."*

Cancer, heart disease, stroke and influenza and pneumonia are all in the top 10 leading causes of death in the U.S.<sup>41</sup> Thymol and carvacrol are two compounds found in thyme and oregano that may have a positive effect on your blood pressure, viral infections and tumor suppression and prevention. Herbs have multiple beneficial components that work synergistically.

Like biologically active compounds found in drugs, the natural compounds found in herbs can interact with pharmaceuticals. This can pose some risk when the compounds are taken as extracts and the individuals are also taking other drugs or natural compounds.<sup>42</sup>

Because working with herbs can be complex, for best results consult with a knowledgeable natural health care practitioner who can guide you on the appropriate herbal solutions for your circumstances.

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