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Report

Nutrients to Combat the Modern Stress Epidemic

By Jeffrey Castle



Be it work, finances, relationships, or health issues, most of us experience stressful events at some point in our lives. But today, researchers are witnessing levels of stress that are virtually *unprecedented*.

A startling **80%** of Americans now report experiencing **intense, chronic stress** over personal finances and the economy.¹ And the problem is global: the World Health Organization estimates that stress-related disorders affect nearly 450 million individuals worldwide.²

The effects of this pandemic on the public health are profound.

Researchers have linked the cumulative impact of stress to a host of **age-accelerating** conditions and degenerative diseases.³

These range from cardiovascular disease to diabetes to various cancers.⁴⁻⁷

The good news is that recent confirmatory data show targeted nutritional interventions exert a beneficial effect on many of the biological risk factors produced by stress.^{2,8}

Two natural compounds in particular have been shown to *reduce* stress levels, enhance attention and productivity, and lower many stress-related factors associated with risk of death.

In this article you'll learn the most recent data on the stress-relieving properties of **lemon balm**, a common garden herb, and **L-theanine**, an amino acid found exclusively in tea.

Lemon balm has been shown to exert a calming effect in healthy individuals,⁹ while L-theanine has been found to soothe anxiety, without side effects.¹⁰

Natural Stress and Anxiety Relief

Lemon balm is a common garden herb closely related to mint. It has been prized in traditional cultures for its capacity to induce sleep and mild sedation, as well as for its memory-enhancing properties.^{9,11} Modern-day laboratory techniques reveal some of the underlying mechanisms of lemon balm's clinically proven efficacy.

Lemon balm, and its chief components, **rosmarinic acid**, quercetin, gallic acid, quercitrin, and rutin, are potent antioxidants that protect brain cells and other tissues from reactive oxygen species (ROS).¹² Lemon balm tea, for example, is used to protect radiology technicians from the oxidizing effects of chronic occupational exposure to low-level radiation.¹³



Lemon Balm

Lemon balm and rosmarinic acid also boost levels of the relaxation-inducing neurotransmitter called **GABA** in the brain. They do so by inhibiting the enzyme that normally degrades GABA.¹⁴ The result of these lemon

balm - induced elevations of GABA is a reduction in anxiety.¹⁵ Increasing brain GABA activity is the mechanism by which prescription anti-anxiety drugs act as well, though they can lead to chemical dependency and side effects.^{16,17}

Lemon balm also modulates the important neurotransmitter acetylcholine, the levels of which are reduced in Alzheimer's disease and other neurodegenerative conditions. Rosmarinic acid inhibits acetylcholinesterase, the enzyme that breaks down acetylcholine and reduces its availability to brain cells.¹⁸ This effect is similar to that produced by prescription drugs meant to treat Alzheimer's disease.

Animal studies reveal powerful anxiety- and stress-reducing effects of lemon balm.¹⁹ Mice demonstrate significantly reduced anxiety in maze experiments following supplementation with lemon balm extract, without any changes in overall activity level or memory.¹⁵

Mice conditioned to experience chronic fear showed significantly reduced stress responses and more appropriate behavior following dosing with rosmarinic acid, an effect with substantial implications for humans living with chronic anxiety and stress.²⁰ Lemon balm extracts also reduce pain from a variety of stimuli, further contributing to their soothing, stress-relieving effects.²¹

Human studies of lemon balm are equally compelling, as demonstrated in a series of trials conducted in the Human Cognitive Neuroscience Unit at the University of Northumbria in the United Kingdom. Researchers there found that **600 mg** of lemon balm produced sustained improvements in a test of "accuracy of attention." Three hundred milligrams of lemon balm produced an increase in self-rated *calmness* in a group of healthy adults, while **900 mg** of lemon balm reduced self-rated alertness.⁹ That latter finding is a desirable effect in a supplement meant to produce relaxation.

A subsequent study using higher doses demonstrated significant improvements in both *calmness* and *memory* performance at all time points following a single **1,600 mg** dose.¹¹

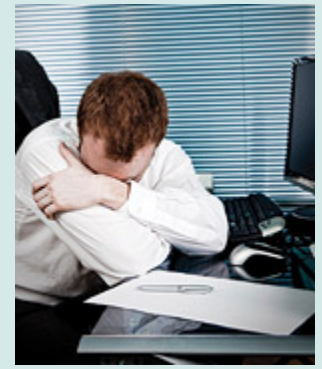
The British researchers next evaluated lemon balm in a more challenging test, namely in a setting in which subjects are deliberately stressed in the laboratory. They gave 18 healthy volunteers doses of **300** or **600 mg** of lemon balm, or a placebo, and then subjected them to the Defined Intensity Stressor Simulation, a battery of challenges designed to impose stress.²² The higher dose counteracted the negative mood effects of the stress test, while significantly increasing self-ratings of calmness and again reducing self-ratings of alertness. Similar results were later shown with a supplement containing both lemon balm and valerian root, another natural sedative.²³

Interestingly, the lower dose of lemon balm (300 mg) also increases the speed of mathematical processing, with no reduction in accuracy, in human studies.²² That observation, combined with some findings about the molecular actions of rosmarinic acid, has led scientists to examine lemon balm's effects in Alzheimer's disease and other conditions of cognitive impairment.

The antioxidant protection provided by lemon balm shows promise in reducing oxidant-related *brain cell death*, an important contributor to Alzheimer's and Parkinson's diseases as well as age-related cognitive decline.²⁴ Lemon balm and its components are also highly effective at reducing accumulations of the harmful amyloid-beta, a protein that is a leading contributor to Alzheimer's disease.²⁵⁻²⁷ Lemon balm's ability to inhibit the enzyme *acetylcholinesterase* boosts brain levels of the neurotransmitter acetylcholine, which are low in Alzheimer's.^{18,28} These and other mechanisms of lemon balm and its components are credited with *improving cognitive performance* in maze experiments with animals.²⁹

Human studies of lemon balm extracts in treatment of Alzheimer's have been encouraging. In one study, supplemented patients with mild to moderate Alzheimer's, aged 65-80 years, demonstrated significantly better outcomes on tests of cognitive function than did placebo recipients.³⁰ That study also found a reduction in agitation in supplemented patients compared with placebo recipients. In a related study, aromatherapy with lemon balm essential oil reduced agitation in **60%** of patients with severe dementia, compared with just **14%** in a placebo group.³¹ Total agitation scores were reduced by an average of **35%**, compared with just **11%** in placebo recipients.

- Eighty percent of Americans experience chronic stress, which is a known causative factor of chronic disease and early death.
- Stress exerts a well-defined impact on all body systems, resulting in elevated plasma cortisol levels and abnormal release of inflammatory cytokines.
- New research designates lemon balm and L-theanine, two natural products, as significant contributors to reduced stress and anxiety.
- The two ingredients work by different but complementary mechanisms to lower the physical manifestations of stress and promote long life span.
- Both lemon balm and L-theanine also demonstrate substantial neuroprotective characteristics through mechanisms related to their calming effects on brain cells.



Calming Overactive Neural Networks, Improving Cognition

L-theanine is a non-protein amino acid found exclusively in **green tea**.^{32,33} It contributes significantly to the favorable taste of green tea and has numerous health-promoting benefits.³³ It has traditionally been used to enhance relaxation and improve concentration and learning ability.^{34,35} Those features have modern scientists interested in its potential as a natural stress-reliever.³²

L-theanine is chemically related to the neurotransmitter **glutamate** and binds to glutamate receptors in the brain.^{36,37} Unlike glutamate, however, which can cause a state called **excitotoxicity** that can eventually damage nerve cells, L-theanine **protects** brain cells **against** excitotoxicity, calming the nerve networks in the brain.³⁷⁻³⁹

Animal studies verify the behavioral benefits of these biochemical effects. In isolated rat brain slices, L-theanine reduces electrical activity associated with anxiety.⁴⁰ L-theanine **reduces evidence of anxiety and depression** in several different animal models of stress.^{41,42} In freely moving rats, L-theanine led to decreases in nearly all frequencies of brainwave activity, indicating a state of calmness and relaxation.⁴³ That is hardly surprising: L-theanine is known to be synergistic with the GABA-enhancing anti-anxiety drug midazolam, a relative of **Valium®**.⁴²

TABLE 1: HEALTH RISKS ASSOCIATED WITH EXCESS STRESS

Stressor	Health Outcome	Increased Risk
Sleep Disturbances ⁵⁶	Early Death from All Causes	170%
Perceived Stress ⁵⁷	<ul style="list-style-type: none"> • Early Death from All Causes • Death from Respiratory Disease • Death from Heart Attacks • Death from External Causes • Suicide 	32% 79% 159% 207% 491%
Adverse Childhood Experiences ⁵⁸	Death by Age 65	140%
Stress at Work ^{6,59}	<ul style="list-style-type: none"> • Risk of Type 2 Diabetes in Women • Death from Cardiac Causes • Early Death from All Causes 	94% 181% 65%

Not Enough Reward for Effort at Work ⁶⁰	Poor Self-Rated Health	Up to 280%
Divorce ³	Total and Cardiovascular Death	37% (Men)
Major Negative Life Events ⁷	Breast Cancer	533%

Life stressors and sleep disruptions dramatically increase your risk of bad health outcomes and premature death.

Brainwave studies have shed some light on how L-theanine achieves its remarkable anxiety-reducing effects. In one study, healthy subjects took a soft drink containing green tea enriched with L-theanine while their brainwave power was measured.⁴⁴ Power was initially reduced in all frequencies and areas during the first hour, indicating relaxation. Later changes indicated both an increase in mental performance and a higher degree of relaxation. In this case, L-theanine seemed to produce desirable increases in attention, accompanied by durable relaxation - that means subjects could concentrate better without being distracted by anxiety.

Another brainwave study demonstrated that L-theanine significantly increased activity in the frequency band indicating relaxation without inducing drowsiness.⁴⁵ And a third concluded that L-theanine plays a general role in sustaining attention during a long-term difficult task.⁴⁶ That's important, because it is known that while stress and anxiety can reduce your ability to maintain attention and focus, promoting attention and focus is an effective way of reducing your stress and anxiety.⁴⁷

WHY "L"-THEANINE?



L-theanine is the amino acid that gives green tea its delightfully subtle taste and also provides many of its health benefits, particularly those involving the nervous system. Why do we refer to it as "L"-theanine, and what is the significance?

Most biologically active compounds can occur in two forms, each the mirror-image of the other. Scientists use the prefixes "D" and "L" to distinguish between the two forms. Only one form (usually the "L" form) is biologically active, however.

When humans manufacture biological molecules, as opposed to extracting them from natural sources, we typically produce a mixture containing both forms in equal measure - a so-called "racemic" mixture. When you consume such a mixture, then, you are only getting 50% of the actual biological activity; the rest is simply wasted.

Not all supplements are alike; look for the designation "L-theanine" to be sure you are taking the most potent and biologically sound form of this valuable stress-relieving substance.

Another way to assess stress and anxiety is by measuring vital signs such as heart rate and salivary content of certain proteins that are increased during stress. Japanese researchers did just that with 12 subjects during a mental arithmetic test given as an acute stressor.⁸ Results showed that the supplement reduced heart rate and salivary protein responses to the acute stress task, compared with placebo. In addition, heart rate variability was improved, a sign that the L-theanine was reducing activation of the sympathetic nervous system, or "fight-or-flight" response. Improved heart rate variability is a protective factor against cardiovascular disease, so L-theanine's anti-stress effects in this case are also indirectly *cardioprotective*.⁵

Physical Symptoms of Stress	Prevalence	Psychological Effects of Stress	Prevalence
Fatigue	51%	Irritability or Anger	50%
Headache	44%	Feeling Nervous	45%
Upset Stomach	34%	Lack of Energy	45%
Muscle Tension	30%	Feeling a Need to Cry	35%
Change in Appetite	23%		
Teeth Grinding	17%		
Change in Sex Drive	15%		
Feeling Dizzy	13%		

Several studies have now also shown that L-theanine substantially augments the known attention-focusing effects of *caffeine*. Adding L-theanine to caffeine leads to improved accuracy and speed of information processing, less susceptibility to distraction, improved switching between tasks, and less mental fatigue, while improving reaction time and reducing physical symptoms such as headache and tiredness.⁴⁸⁻⁵¹

Unfortunately, the amounts of L-theanine in a regular cup of caffeinated green tea are not large enough to produce the anti-anxiety effects, meaning supplementation is necessary. Most studies of L-theanine showing benefits use doses of between **100** and **250 mg** per day, while a cup of green tea typically contains **20 mg** or less.⁴⁵

L-theanine's many neuroprotective effects make it an attractive natural product for preventing and treating disorders such as Alzheimer's disease.⁵² A placebo-controlled clinical study in mid-2011 examined the effects of L-theanine and green tea extract on memory and attention in a group of adults with mild cognitive impairment.⁵³ Mild cognitive impairment is often seen as a precursor or risk factor for Alzheimer's disease.^{54,55} The supplemented group experienced improvements in memory and selective attention (the ability to attend to one task without being distracted by others). Brain waves indicative of *cognitive alertness* were significantly increased by the supplement as well.

Summary

Stress and anxiety plague 80% of Americans. Far from being mere annoyances, these psychological conditions have profound physical implications. It is no exaggeration to say that stress can shorten your life.

Prescription sedatives and anti-anxiety drugs have some short-term benefit in reducing symptoms, but their long-term safety and effectiveness has not been established, and they carry risks of significant side effects, tolerance (loss of efficacy) and addiction.

Lemon balm and L-theanine, on the other hand, offer powerful protection against stress and anxiety through distinct and

complementary mechanisms. Both have been shown to reduce not only stress but the biological manifestations it produces in the body and brain. And both have additional neuroprotective characteristics as well. If you suffer from stress and anxiety, consider adding a combination supplement containing high-quality lemon balm and L-theanine to your health maintenance regimen.

If you have any questions on the scientific content of this article, please call a **Life Extension®** Health Advisor at 1-866-864-3027.

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