QUERCETIN: Broad-Spectrum PROTECTION
Many of our most powerful medicines, including those for diabetes, chemotherapy, and cardiovascular health, are derived from plant extracts. One reason that plants hold so much potential for human health is that they are able to withstand a variety of destructive forces such as environmental radiation, oxidative damage, and chemical toxins due to their unique ability to manufacture complex molecules called flavonoids.\textsuperscript{1-4} For humans, these same conditions can be lethal. Yet when we consume plants as food and beverages, the protective benefits of these same flavonoids are readily transferred to our bodies!\textsuperscript{5}

One flavonoid in particular, \textit{quercetin}, is found in a broad range of foods, from grape skins and red onions to green tea and tomatoes. Quercetin is attracting intense scientific interest for its unique anti-aging and immune-boosting activities.\textsuperscript{6} Several recent studies show that organisms exposed to high levels of quercetin live longer, healthier lives.\textsuperscript{6-12} Laboratory models of aging, ranging from simple yeasts and primitive worms to cultured human cells, demonstrate that quercetin alone produces up to a 60% increase in life span\textsuperscript{6,8-12}. In addition, quercetin has been found to be cancer chemopreventive as well as reduce allergic reactions, boost immunity, and protect the cardiovascular system.

Due to its synergies with \textit{resveratrol}, health-conscious people often obtain some quercetin in science-based resveratrol formulas they already use. >>
Quercetin is naturally abundant in plant foods and as a result is highly bioavailable. Nonetheless, most people do not obtain sufficient quercetin levels through their daily diets. This is unfortunate because large-scale epidemiological studies show that sustained high intake of quercetin and related flavonoids provides substantial protection against cardiovascular disease.

In a study of 805 men aged 65-84 years, those with the highest quercetin and other flavonoid intake were 68% less likely to die from coronary heart disease than those with the lowest intake. A similar study found a reduction in death rates from all causes of 31% for women and 24% for men, with a 46% reduction in coronary death rates for women and a 22% reduction for men in those with the highest intakes.

This dramatic cardiovascular protection is the result of a concerted synergy between several basic quercetin mechanisms, including its ability to lower cholesterol and reduce dangerous accumulations of abdominal and liver fat.

In one study on quercetin’s impact on cholesterol levels, a group of otherwise healthy male smokers took 100 mg/day of quercetin or a placebo for 10 weeks, with blood tests done at baseline and at the end of the study. The supplemented group, but not the placebo group, had significant reductions in total and LDL cholesterol, and an increase in HDL cholesterol. They also had a significant reduction in blood sugar, another cardiovascular risk factor.

A larger study of non-smokers showed similar results, with an 18% reduction in total cholesterol, a 27% reduction in LDL, and an important 33% increase in beneficial HDL cholesterol. Animal and human studies also suggest that quercetin supplementation can reduce dangerous accumulations of abdominal and liver fat, the result of decreased oxidative stress and inflammation.

Lowering cholesterol and reducing body fat are important first steps, but quercetin’s cardiovascular benefits go farther, lowering blood pressure and increasing plasma levels of nitric oxide, thus providing more of the synergy mentioned earlier.

By blocking oxidation of LDL cholesterol, quercetin counteracts a major source of the blood vessel inflammation that precedes atherosclerosis. One human study found a 28% reduction in the rate of LDL oxidation following two weeks of supplementation with quercetin at just 30 mg/day.

Higher doses of quercetin have shown the ability to modestly lower blood pressure. Quercetin supplements of 730 mg/day reduced hypertensive people’s systolic (top number) blood pressure by 7 units (mmHg), and diastolic (bottom number) pressure by 5 units (mmHg). Those with normal blood pressure retained their healthy levels and did not experience a dangerous drop in blood pressure as is often the case with the use of anti-hypertensive medications. These results have been confirmed in other studies, with lower doses in the range of 100 - 200 mg/day.

Quercetin also appears to exert its blood pressure-lowering effects by improving the health of your endothelium, the lining layer of the arteries that controls healthy arterial blood flow and atherosclerotic plaque flow. The diagram above shows the difference between healthy arterial blood flow (top image) and compromised arterial flow (bottom image) due to atherosclerotic plaque.
blood flow and pressure. Supplemental quercetin in hypertensive rats allowed “tight” blood vessels to relax, reducing their blood pressure.27

Quercetin supplements of 200 mg/day in healthy men increased blood levels of nitric oxide, a substance produced in endothelial cells that’s required for vessels to dilate and lower blood pressure.28 Heart muscle that is overloaded by excess blood pressure loses its responsiveness to nitric oxide.29,30 It becomes overgrown, or hypertrophied and eventually loses its ability to pump blood effectively. This can lead to early death or disability.30 Quercetin completely blocks pressure overload-induced cardiac hypertrophy in animal models of hypertension which is the result of beneficial changes in gene expression in heart muscle tissue.30

Another of quercetin’s cardiovascular benefits is its ability to inhibit platelet aggregation or “stickiness” in platelets. Oxidant stress and inflammation trigger this excessive “stickiness” in platelets and blood vessel walls. Untreated, the result can lead to a stroke or a heart attack following blood clot formation.

Human volunteers taking a highly bioavailable form of quercetin at both 150 and 300 mg/day rapidly (within 30 minutes) inhibited platelet aggregation.31 This effect proved to be the result of multiple changes in biochemical signaling pathways and gene expression, resulting in a healthier, “non-sticky” condition of the platelets.

Quercetin Shuts Down Cancer Cells Early

Cancers of all kinds are the second leading cause of death in the US, behind cardiovascular disease.32 Faced with the overwhelming challenge of achieving a cure, oncologists are increasingly turning to “chemoprevention” with nutrients as the most effective way to battle malignancies.33

Quercetin’s multitargeted disease-fighting capabilities make it a natural choice as a chemopreventive compound. Strong evidence from epidemiological studies have shown that people with the highest quercetin intake enjoy substantially reduced risks for many of the leading causes of cancer death:

- For lung cancer, the top cause of cancer deaths,34 a 51% overall risk reduction, and a 65% reduction among smokers35
- For colon cancer, the second cause of cancer deaths,36 a 32% reduction in risk37
- For gastric (stomach) cancer, a 43% overall risk reduction and an impressive 80% reduction in risk among female smokers38
- And there’s compelling laboratory evidence for quercetin’s role in reducing risk of breast, prostate, and liver cancers as well.39-41
At the cellular level, quercetin interferes with the processes that turn healthy cells into malignant cancer cells. Quercetin’s antioxidant and anti-inflammatory properties protect cellular DNA from dangerous cancer-inducing mutations. Quercetin “freezes” rapidly reproducing cancer cells into an early, non-productive phase of the cell replication cycle. This not only stops tumor growth but also triggers cell death by apoptosis—the innate programming healthy cells use to stop excessive reproduction. And quercetin favorably modulates chemical signaling pathways that are abnormal in cancer cells.

All of these separate actions can dramatically reduce the chances that any given cancer cell will successfully form a real tumor. And that is precisely how chemoprevention is meant to work.

Here are details about quercetin’s impact on some of the most common and dangerous human cancer types, from laboratory studies:

- **Quercetin decreases the number and size of pre-cancerous lesions in the colon.** These lesions are called “aberrant crypt foci,” which are one of the danger signs your gastroenterologist looks for during a colonoscopy.

- **Quercetin interferes with early lung cancer lesions.** Laboratory studies demonstrate that quercetin traps developing cancer cells in the early phases of their replication cycle, effectively preventing further malignant development and promoting cancer cell death. In one dramatic study, laboratory rats were treated with quercetin before exposure to the powerful environmental carcinogen, benzo(a)pyrene. This compound is found in cigarette smoke, charbroiled foods, and automobile (particularly diesel) exhaust, making it among the most common pollutants in our environment. Untreated rats developed lung cancers but rats supplemented first with quercetin showed no such findings.

- **Quercetin prevents development of liver cancer cells.** Your liver is your body’s “toxic waste dump,” receiving and detoxifying the bulk of the poisons it is exposed to every day. As a result, liver cells are at the epicenter of toxin-induced cancer development. Studies show that quercetin ramps up human liver cells’ production of protective proteins and enzyme systems, blocks the cancer replicative cell cycle, and reduces toxin-induced DNA mutations. Many of the gravest cancer-related threats to liver tissue come from increased oxidant damage. Quercetin mitigates that damage by sharply increasing liver cells’ production of natural protective antioxidant enzyme systems. The result, again, is a marked reduction in formation and replication of cancerous liver cells.

- **Quercetin interferes with sex hormone receptors on reproductive system cancers.** It blocks the androgen receptors used to sustain growth by prostate cancer cells, potentially preventing such cells from forming tumors. In breast cancer cells, on the other hand, quercetin stimulates estrogen receptors, but only the so-called “beta,” or cancer-suppressing receptors, not the “alpha,” or cancer-promoting ones.

These cumulative effects put quercetin at the top of the list of potential cancer chemopreventive supplements.
Quercetin Blunts Allergies, Asthma Attacks, and Protects Lungs

Allergic responses can range from the merely irritating to the life-threatening. Triggers can involve sources from food (such as peanuts) or the environment (such as pollen). What many people don’t realize is that allergy-like responses are responsible for most of the symptoms of asthma and even chronic obstructive pulmonary disease (COPD).

Quercetin powerfully and favorably modifies the allergic response in potentially life-saving ways.

Let’s start with allergies, which are produced by “pre-sensitizing” a person to a particular substance (an allergen). Quercetin blocks the allergic response at several points. It suppresses the actions of immune system cells, reducing the amount of the substance called histamine, that accounts for itchy skin, watery eyes, and (more dangerously) loss of blood pressure during serious allergic reactions. Quercetin also impairs the function of certain cell types that lie at the heart of the allergic and autoimmune processes.54 Studies show that for skin allergies (contact dermatitis), quercetin is more effective than the standard drug cromolyn at inhibiting inflammatory cytokine release.55

Food allergies may be particularly responsive to quercetin prevention. Studies show that quercetin blocks intestinal inflammation stimulated by the allergy-related antibodies.56 That can reduce both local discomfort and dangerous systemic symptoms of food allergies.

Quercetin’s Mechanism of Action

Quercetin accomplishes its life-extending, anti-aging benefits through a multitude of mechanisms of action:

Much, but by no means all, of that impact comes from quercetin’s multi-targeted antioxidant activity — it is among the foremost antioxidants in the natural world.74,75

Scientists are now finding, however, that quercetin has a host of remarkable characteristics that go well beyond the antioxidant and anti-inflammatory that we’ve come to recognize as typical of phyto-molecules in general. Here’s a partial list of known life-extending, anti-aging mechanisms of action attributed to quercetin:

- Antioxidant, free radical scavenger6,8,9
- Anti-inflammatory, especially in fat tissue39,76-79
- Prevents DNA damage8
- Regulates gene expression in favor of youthful characteristics10,12
- Supports natural stress responses80
- Increases proteasome activation, hastening disposal of damaged and aging proteins11
In one important animal study, quercetin completely blocked the deadly “anaphylactic” response to peanuts in peanut-allergic rats. The animals had much lower histamine levels than did control animals, and none of the airway tightening, blood pressure lowering, or blood vessel leakiness seen in controls exposed to peanuts. This study has powerful implications for future study in humans, since peanut allergy is the leading cause of fatal or life-threatening food allergies.

In asthma, smooth muscles in the airway tubes (trachea and bronchi) constrict excessively in response to an allergic stimulus. Most of the cellular mechanisms involved are similar to those seen in allergies. When those smooth muscles constrict, airways narrow, and breathing becomes difficult. The result is the familiar wheezing sound and need to push air out of the lungs that we see in people suffering from asthma.

Quercetin blunts the allergy-like components of the asthma response. It reduces the number and activation of inflammatory immune system cells, cuts histamine levels, and relaxes airway smooth muscle. In one study, quercetin was at least as effective as standard asthma maintenance medications such as cromolyn and inhaled steroids at reducing the resistance to air flow.

As we get older, many people with asthma develop a related condition called chronic obstructive pulmonary disease, or COPD. In COPD, chronic inflammation, oxidant stress, and physical damage to the lungs conspire to obstruct airflow. In severe cases, the walls between alveoli (tiny air sacs) break down in the condition known as emphysema, that results in wheezing, labored breathing, and eventually heart disease.

Quercetin in laboratory studies opens up COPD-inflicted airways. It restores normal elasticity of lung tissue and reduces inflammation. Just as important, it reduces production of the protein-melting enzymes that dissolve alveolar walls, helping to retain the lungs’ normal architecture and function.

One important additional benefit of quercetin is its ability to interfere with the facial “flush” that many people experience when taking niacin supplements to control cholesterol. Niacin is one of the most effective agents for normalizing cholesterol levels, but because of the “flush” (redness and burning), regular dosing is often skipped due to physical discomfort. In one recent study a daily dose of 150 mg of quercetin reduced symptoms by more than 47%, and the duration of the flush by 56%.

**Quercetin Boosts Immunity, Fights Infection**

Quercetin also acts at the other end of the immune system spectrum by boosting the immune response to many common viruses and bacteria. That makes it especially important for older adults whose immunity declines, making them increasingly susceptible to dangerous infections.

Quercetin kills viruses in laboratory dishes, though the mechanisms are not entirely clear. In one study, quercetin inhibited influenza A virus replication in the laboratory more effectively than the anti-flu drug
Tamiflu®. In another study, quercetin inhibited hepatitis C virus replication. Hepatitis C is a major cause of liver failure and liver cancers. Finally, quercetin blocked replication of the rhinovirus, the virus responsible for the common cold.

Not surprisingly, then, quercetin-supplemented animals display fewer symptoms and greater survival in the face of several different types of virus. Mice infected with influenza A virus, but supplemented with quercetin just before and for six days following infection, had significantly fewer serious symptoms of flu. They also survived longer.

In-depth study showed that the animals had an astonishing 2,000-fold lower number of viruses in their lungs; in fact, they had just half of the virus load as did animals treated with Tamiflu®.

Adults who supplement with quercetin are significantly less likely to develop colds and upper respiratory tract infections following intensive exercise: in one study just 5% of supplemented subjects got sick, while 45% of control patients experienced colds. And in a population of middle-aged and older adults who were physically fit, 1,000 mg quercetin/day reduced the number of sick days taken for colds by 31%, and the severity of symptoms by 36%.

Quercetin is also effective against bacterial infections. It decreased the infection rate and inflammatory response to Helicobacter pylori, the cause of many ulcers and eventually cancers of the stomach. Quercetin also reduced inflammatory responses and strengthened host defenses in experimental Salmonella infections, a major cause of death and disability, especially in older adults.

**Summary**

Mother Nature protects plant life from the most extreme and harsh environments on our planet. She does it by protecting them with powerful phytochemicals, the most common of which is quercetin. Fortunately, that protective effect is readily transferred when we consume quercetin ourselves. Quercetin extends animal life spans, in large part by protecting us against the same general threats that plants face: oxidant stress, DNA damage, and environmental toxins. A rapidly expanding body of scientific evidence now links high quercetin consumption to improved cardiovascular health, reduced cancer risk, milder allergic responses, and improved resistance to infection. Getting enough plant-based nutrients is a major problem for most people; fortunately, it is easy to boost your quercetin intake with highly bioavailable supplements.

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**References**


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**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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