

## **Small-Cell Lung Cancer and Green Tea**

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The statistics are sobering. Small-cell lung carcinoma (SCLC), which represents 15-20 percent of all lung cancer cases, is fatal within five years in more than 85 percent of the patients who develop it. And because the disease typically becomes resistant to drug therapies, it is particularly insidious and difficult to treat.

That's the bad news. The better news is that the active ingredient in green tea appears to arrest the disease's progress at the cellular level, according to the results of a study\* published in June.

### **What is it about green tea?**

"Because no therapies work too well in treating SCLC, and this cancer tends to become drug-resistant fairly quickly, the prognosis for SCLC patients currently isn't very good," says primary investigator David Sadava, PhD, of the Claremont University Consortium's Keck Science Center and the City of Hope Medical Center. "This study was about looking into other treatment options."

Green tea was a natural choice. "There's data that say it can prevent lung cancer, there are no side effects that I'm aware of, and it's very widely consumed," Sadava says. "And when you look at epidemiology and animal studies of many cancers, green tea is more effective than black tea in many ways."

The active ingredients in green tea are antioxidants called catechins – and the most abundant type of catechin is epigallocatechin-3 gallate (EGCG).

Interestingly, the way tea is prepared changes the catechin content, says Sadava. The preparation of black tea removes or destroys the catechin, while the ingredient is retained in the preparation of green tea.

### **Killing the (enzymatic) messenger**

Eager to see what effect EGCG might have on human SCLC cells, Sadava's team – in the first study of its kind – targeted telomerase, an enzyme that helps cell lines propagate by chemically instructing cells to reproduce. All cells contain the gene for telomerase, and it is expressed in very low levels in most tissues.

But telomerase is fully expressed when sperm and eggs are formed, which is very useful because it ensures that complete genetic information is sent to the cells that form them, Sadava explains. "In general, telomerase tells the cells to keep dividing and prevents programmed cell death," or apoptosis.

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This amazing process of cellular self-perpetuation is obviously not a good thing when it comes to cancer, however. More than 90 percent of SCLC cells express telomerase, a primary reason why this type of cancer can grow so aggressively.

To recap, by using the active ingredient in green tea to kill the molecular messengers telling SCLC cells to divide, the researchers theorized that they could halt the disease's progress.

They appear to be on the right track.

"Less than 24 hours after introducing EGCG to the tumor cells, we saw a 50-60 percent reduction in telomerase activity," says Sadava. "That reduction resulted in a number of the hallmarks of programmed cell death: the cancer cells' DNA started breaking, the cells stopped dividing, and the production of an enzyme [caspase] that destroys cells' nuclei was induced."

This data is compelling not only because it indicates a possible cancer-slowing effect, but also because it could lead to drug resistance becoming a non-issue. The idea is to stop tumor growth early on.

While these results are encouraging for people at risk of developing small-cell lung carcinoma and the oncology community in general, Sadava says that much additional research is needed.

For the time being, speak with your doctor if you're thinking of incorporating green tea into your diet. Because the half-life of the active ingredient in green tea is very short in humans, Sadava says, data indicates that people must drink several cups a day to have any effect on cancer.

*Sadava, D et al., The Green Tea Polyphenol, Epigallocatechin-3-Gallate Inhibits Telomerase and Induces Apoptosis in Drug-Resistant Lung Cancer Cells. Biochemical and Biophysical Research Communications, 2007 Jun 14; [Epub ahead of print]*

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