

An apple a day could help protect against brain-cell damage that triggers Alzheimer's, Parkinsonism, Cornell studies find

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ITHACA, N.Y. -- A group of chemicals in apples could protect the brain from the type of damage that triggers such neurodegenerative diseases as Alzheimer's and Parkinsonism, according to two new studies from Cornell University food scientists.

The studies show that the chemical quercetin, a so-called phytonutrient, appears to be largely responsible for protecting rat brain cells when assaulted by oxidative stress in laboratory tests.

Phytonutrients, such as phenolic acids and flavanoids, protect the apple against bacteria, viruses and fungi and provide the fruit's anti-oxidant and anti-cancer benefits. Quercetin is a major flavanoid in apples. Antioxidants help prevent cancer by mopping up cell-damaging free radicals and inhibiting the production of reactive substances that could damage normal cells.

"The studies show that additional apple consumption not only may help reduce the risk of cancer, as previous studies have shown, but also that an apple a day may supply major bioactive compounds, which may play an important role in reducing the risk of neurodegenerative disorders," says Chang Y. "Cy" Lee, Cornell professor of food science at the university's New York State Agricultural Experiment Station in Geneva, N.Y.

In a study that recently appeared online and is to be published in the November/December 2004 issue of the *Journal of Food Science* (69(9): S357-60), Lee and his co-authors compared how two groups of rat neuronal cells fared against hydrogen peroxide, a common oxidative stressor. Only one of the two groups was pretreated with different concentrations of apple phenolic extracts.

The researchers found that the higher the concentration of apple phenolic extract, the greater the protection was for the nerve cells against oxidative stress.

"What we found was that the apple phenolics, which are naturally occurring antioxidants found in fresh apples, can protect nerve cells from neurotoxicity induced by oxidative stress," Lee said.

When Lee and co-author Ho Jin Heo, a visiting fellow at Cornell, looked at quercetin they found that it appeared to be the main agent responsible for the beneficial effect. In fact, they found quercetin works even better in protecting nerve cells against hydrogen peroxide than vitamin C, a naturally occurring antioxidant known to help prevent cell and tissue damage from oxidation. Quercetin is primarily found in apples, berries and onions.

This study, which appeared online recently, will be published in the December issue of the *Journal of Agricultural and Food Chemistry*.

The two studies build on Lee's 2002 findings that quercetin has stronger anti-cancer activity than vitamin C, and his 2000 findings that phytochemicals in apples have stronger anti-oxidant protective effects than vitamin C against colon and liver cancer cells.

Other studies have found that phytochemicals are associated with a reduced risk of cancer, heart disease and diabetes, and that they fight not only cancer but also bacterial and viral infections. In addition, they are anti-allergenic and anti-inflammatory.

Although Lee stresses that his studies were conducted in the laboratory, not in clinical trials with humans, he has no hesitation in recommending more apples in the diet as well as other fresh fruits and vegetables. "Indeed, I have a reason to say an apple a day keeps the doctor away," he says.

The researchers used red delicious apples grown in New York state to provide the extracts to study the effects of phytochemicals. Lee said that all apples are high in the critical phytonutrients and that the amount of phenolic compounds in the apple flesh and in the skin vary from year to year, season to season and from growing region to growing region.

The study on apple phenolics, which was co-authored by Heo and D.O. Kim, a postdoctoral researcher at Cornell, as well as S.J. Choi and D.H. Shin at Korea University, was supported in part by Heo's postdoctoral fellowship through the Korea Science and Engineering Foundation (KSEF) and the U.S. Department of Agriculture. The study on quercetin, authored by Lee and Heo, also was supported, in part, by the KSEF fellowship program and U.S. Apple Association.

Related World Wide Web sites: The following sites provide additional information on this news release. Some might not be part of the Cornell University community, and Cornell has no control over their content or availability.

- Study on apple phenolics: <http://bookstore.myift.org/store/iftstore/newstore.cgi?itemid=22941&view=item&categoryid=928&categoryparent=928&page=1&loginid=1370366>>
- , Study on quercetin: <http://pubs.acs.org/cgi-bin/asap.cgi/jafcau/asap/abs/jf049243r.html>

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