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## Plant ingredients and protection of brain cells\*

### Purpose

This study is not directly about the Iiyiyiu anti-diabetic plants. Rather, it looks more broadly at whether plant ingredients can protect nerve cells against damage from something called Platelet-activating factor (PAF). PAF damage is implicated in Alzheimer's disease, which is the main focus of this study. But PAF damage is also implicated in some of the complications of diabetes, so there is a link to be made.

The study looks at whether a particular type of plant ingredients—flavonoids—could help protect nerves against PAF damage. Some (but not all) of the flavonoids being looked at are ones that have been found in the Iiyiyiu anti-diabetic plants. In this sense, the anti-diabetic plant work has influenced the choice of flavonoids included in this study.

### About PAF and damage to nerve cells

Our brains and spinal cords are largely made up of nerve cells. They also contain various types of “signalling molecules” — messengers that pass information from one cell to another. PAF is one such family of signalling molecules. Our bodies produce PAF, and it plays a role in inflammation. In our brains, it plays a role in memory.

With some diseases, people develop unusually high levels of PAF. These high levels actually signal to brain and other nerve cells to self-destruct. This contributes to problems like stroke, dementia, and Alzheimer's disease.

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\* This is a plain-language summary of an article by Cory Harris, Scott Ryan, Tia Moffat, Fan Mo, Pierre Haddad, John Arnason, and Steffany Bennett called “Flavonoids as novel inhibitors of platelet-activating factor-mediated neuronal death.” (Draft of September 15, 2008).

Among the various PAF molecules, one type (PAF16:0) seems to be especially involved in damaging brain cells. Most PAF molecules work on a key-in-lock mechanism, so past research has focused on ways to block that particular mechanism. But the brain contains few of these “locks,” and yet PAF16:0 can do considerable damage. So we deduce that PAF16:0 must work in some other, unknown, way. The purpose of this study was to see if some types of flavonoids would block whatever that unknown mechanism is. That is, the study looked not just at PAF damage, but specifically at PAF damage that happens in the absence of the usual “locks” (PAF receptors).

### Three different sets of tests

The study used three different kinds of tests:

1. Tests on nerve-like cells. The researchers used this first set of tests as a way to identify the most promising flavonoids. These were then used for the next two types of tests.
2. Tests on real nerve cells from mice.
3. Tests on real nerve cells from humans.

### Results

The first round of tests looked at 15 flavonoids, of which two were especially effective. These two were called quercetin and hesperetin. Quercetin has been found in several of the Iiyiyiu healing plants, and is present in blueberries and Ginko. Hesperetin is common in plants like citrus and mints.

The next two tests on real nerve cells confirmed that quercetin and hesperetin work. Usually, when you put nerve cells that don't have “locks” into a dish with lots of PAF16:0, the cells die. Researchers think this is because the PAF16:0 sends a signal to the cell telling it to self-destruct. But quercetin and hesperetin seem to block the signal. So when you add one of these to the mix, fewer cells

die. As an added benefit, these two flavonoids don't damage the regular types of nerve cells that *do* have locks in them.

Next, the researchers ran tests on sick nerve cells of the type that are found in people who have Alzheimer's disease. Again, quercetin and hesperetin seemed to protect these cells against damage from PAF16:0.

The researchers concluded that flavonoids—especially the two included in this study—have a lot of promise for reducing damage to nerve cells in the brain and elsewhere. This could make them useful for treating Alzheimer's disease and the kinds of nerve damage that go with diabetes. (The nerve damage in diabetes causes things like pain or numbness in the hands and feet as well as eye problems.)