Caffeine as a biomarker for Parkinson's disease
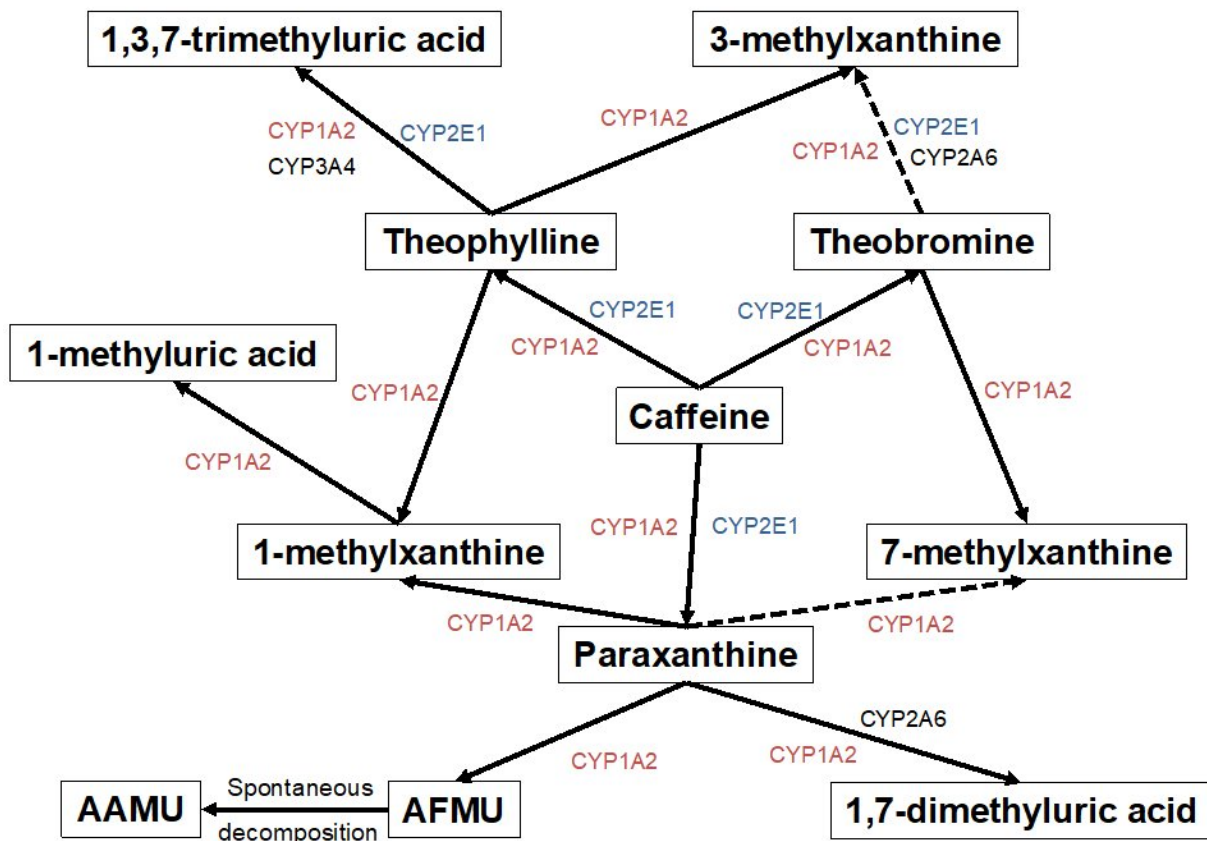
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Figure 1. Caffeine and its byproducts (metabolites) after intake in the human body. Levels of these molecules in the blood are lower for patients with Parkinson's and can hence serve as biomarkers for the disease. Credit: Juntendo University Corporate Communications

Researchers at Juntendo University report in *Neurology* the potential use of blood levels of caffeine and its byproducts as biomarkers for Parkinson's disease. The finding is promising for the development of a method enabling early identification of the disease.

Parkinson's [disease](#) is a degenerative disorder of the central nervous system, affecting the latter's motor system—the part controlling bodily motion. Its symptoms include shaking, rigidity and difficulty with walking. There is evidence that daily caffeine consumption reduces the risk of developing Parkinson's. Now, a team of researchers led by Nobutaka Hattori from Juntendo University School of Medicine have studied how traces of caffeine in the blood, after drinking coffee, can be indicative of Parkinson's disease. The researchers found that caffeine levels are significantly lower in patients with the disease; caffeine concentrations could therefore be used as an indicator of Parkinson's, particularly in its early stages.

The researchers studied a group of 139 people, both men and women, with and without Parkinson's disease. Each person drank between 0 and 5 cups of coffee per day (except for one participant who drank more than six). Then, they checked the participants' blood serum for traces of caffeine and its 11 so-called downstream metabolites—small molecules produced during caffeine-induced metabolic processes in the human body.

The scientists found that the [serum levels](#) of caffeine and of almost all metabolites, including theophylline, theobromine and paraxanthine—caffeine's main byproducts—were lower in patients with Parkinson's disease. Although the data obtained by Hattori's team show that there is a clear relation between a person's caffeine (metabolite) serum levels and having Parkinson's disease, there was no significant association between the severity of the disease and the concentration of any of the caffeine-related substances. Also, there was no significant

difference in serum levels between male and female patients (males are known to suffer more often from Parkinson's disease).

The findings of Hattori and colleagues suggest that caffeine and caffeine metabolite levels in the blood can be, quoting the researchers, "early diagnostic biomarkers for the [Parkinson's] disease"; moreover, the results "further indicated the neuroprotective effects of caffeine."

Parkinson's disease

In patients suffering from Parkinson's disease, progressive loss of the function or structure of neurons (brain cells) leads to a disorder of the central nervous system, affecting its motor system. Tremor, slowness of movement and difficulties with walking are among the main symptoms in the early stages of Parkinson's, with dementia being common at more advanced stages.

The cause of Parkinson's disease is unclear, but it is believed that genetic and environmental factors play a role. Men are more affected than women, and people who drink tea or coffee have a reduced risk. The latter inspired Nobutaka Hattori and colleagues from Juntendo University School of Medicine to check whether caffeine levels in the blood, and levels of the byproducts (metabolites) that caffeine intake causes, can be used as biomarkers for the diagnosis of Parkinson's disease. They found that this is indeed the case.

Caffeine

Caffeine is an organic molecule that, when consumed through e.g. coffee or tea, stimulates the central nervous system. Its best-known effect is the prevention of (the onset of) drowsiness. Daily caffeine consumption has been shown to reduce the risk of developing

Parkinson's disease in men, and in women not taking hormone replacement therapy—caffeine's neuroprotective effect.

The team of Nobutaka Hattori has now demonstrated that, following caffeine intake, the levels of caffeine and its metabolites in the blood serum are lower for people with Parkinson's, independent of the stage of the disease, implying that these levels could be used as biomarkers for the disease in the early stage.

Provided by Juntendo University Corporate Communications