

Biomarker in urine could be the first to reveal early-stage Alzheimer's disease

30 November 2022



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Alzheimer's disease can remain undetected until it is too late to treat. Large-scale screening programs could help to detect early-stage disease, but current diagnostic methods are too cumbersome and expensive. Now, a new study is the first to identify formic acid as a sensitive urinary biomarker that can reveal early-stage Alzheimer's disease, potentially paving the way for inexpensive and convenient disease screening.

Could a simple urine test reveal if someone has early-stage Alzheimer's disease and could this pave the way for large-scale screening programs? A new study in *Frontiers in Aging Neuroscience* certainly suggests so. The researchers tested a large group of patients with Alzheimer's disease of different levels of severity and healthy controls with normal cognition to identify differences in urinary biomarkers.

They found that urinary [formic acid](#) is a sensitive marker of subjective cognitive decline that may indicate the very early stages of Alzheimer's disease. Current methods to diagnose Alzheimer's are expensive, inconvenient, and unsuitable for

routine screening. This means that most patients only receive a diagnosis when it is too late for effective treatment. However, a non-invasive, inexpensive, and convenient urine test for formic acid could be just what the doctor ordered for early screening.

"Alzheimer's disease is a continuous and concealed chronic disease, meaning that it can develop and last for many years before obvious cognitive impairment emerges," said the authors. "The early stages of the disease occur before the irreversible dementia stage, and this is the golden window for intervention and treatment. Therefore, large-scale screening for early-stage Alzheimer's disease is necessary for the elderly."

Alzheimer's screening programs?

So, if early intervention is important, why don't we already have routine screening programs for early-stage Alzheimer's? The issue lies with the diagnostic techniques that doctors currently use. These include positron emission tomography brain scans, which are expensive and expose the patient to radiation. There are also biomarker tests that can reveal Alzheimer's disease, but these require invasive blood draws or a [lumbar puncture](#) to obtain cerebrospinal fluid, which can be off-putting for patients.

However, a urine test is non-invasive and convenient and would be well suited for large-scale screening. While researchers have identified urinary biomarkers for Alzheimer's disease previously, none have been suitable to reveal the early stages of the disease, meaning that the golden window for early treatment remains elusive.

Formic acid: A golden key?

The researchers behind this new study have previously investigated an organic compound called

formaldehyde as a urinary biomarker for Alzheimer's. However, there was room for improvement in detecting early-stage disease. In this latest study they primarily focused on formic acid, a metabolic product of formaldehyde, to see if that performed better as a biomarker.

A total of 574 people participated in the study, and participants were either healthy volunteers with normal cognition, or had differing degrees of disease progression, ranging from subjective cognitive decline to fully-fledged disease. The researchers analyzed the participants' urine and [blood samples](#) and performed psychological evaluations.

Revealing early-stage Alzheimer's disease

The study found that urinary formic acid levels were significantly increased in all the Alzheimer's groups compared with the healthy controls, including the early-stage subjective cognitive decline group, and correlated with a cognitive decline. This suggests that formic acid could act as a sensitive [biomarker](#) for early-stage Alzheimer's disease.

Interestingly, when the researchers analyzed urinary formic levels in combination with blood-based Alzheimer's biomarkers, they found that they could more accurately predict what stage of the disease that a patient was experiencing. However, further research is needed to understand the link between Alzheimer's and formic acid.

"Urinary formic acid showed an excellent sensitivity for early Alzheimer's [screening](#)," said the authors. "The detection of urine biomarkers of Alzheimer's is convenient and cost-effective, and it should be performed during routine physical examinations of the elderly."

More information: Systematic evaluation of urinary formic acid as a new potential biomarker for Alzheimer's Diseases, *Frontiers in Aging Neuroscience* (2022). [DOI: 10.3389/fnagi.2022.1046066](#)

APA citation: Biomarker in urine could be the first to reveal early-stage Alzheimer's disease (2022, November 30) retrieved 5 December 2022 from <https://medicalxpress.com/news/2022-11-biomarker-urine-reveal-early-stage-alzheimer.html>

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