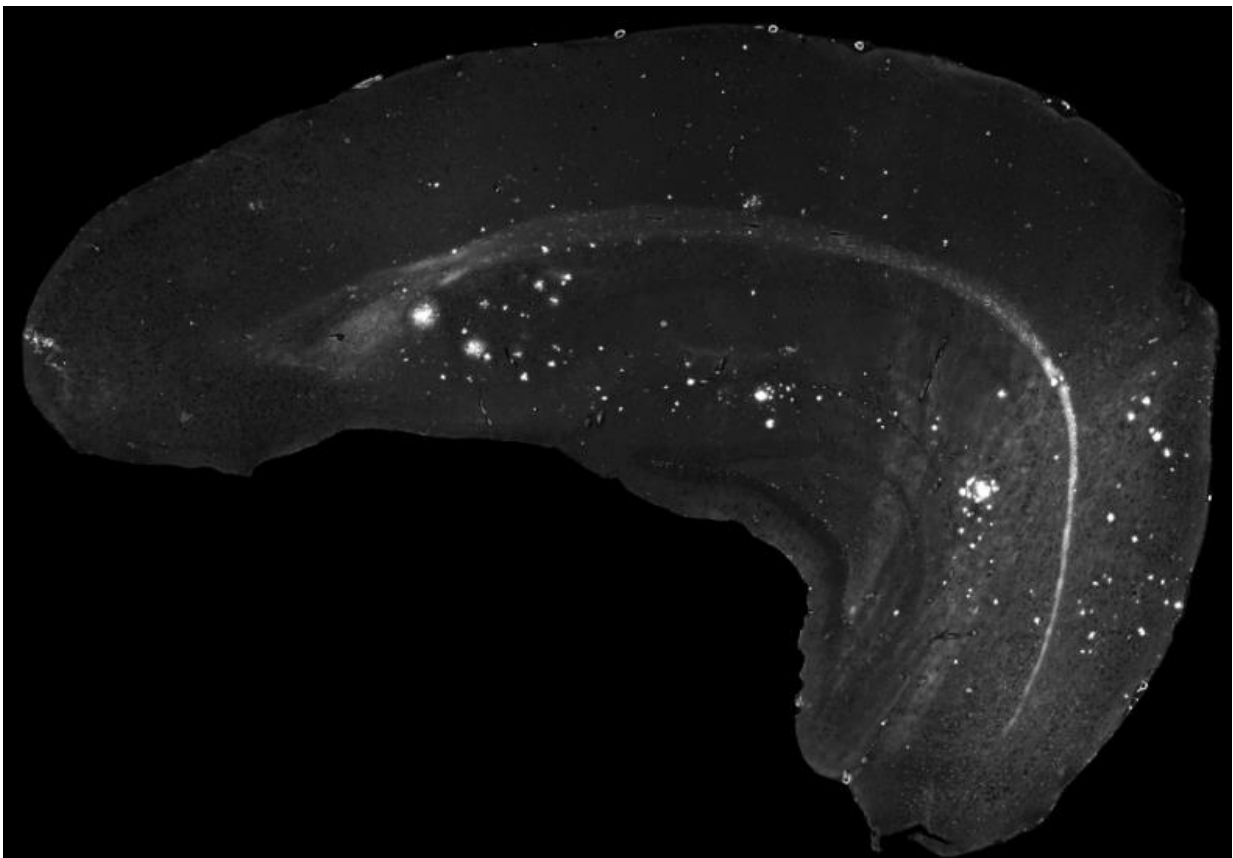


No evidence that low-frequency magnetic fields accelerate development of Alzheimer's disease and ALS

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In the case of animal model Alzheimer's disease, age-related deposits of amyloid-beta protein develop in the brain. This protein can be labeled and thus made visible under a fluorescence microscope. Credit: Albrecht Clement

Low-frequency alternating magnetic fields such as those generated by overhead power lines are considered a potential health risk because epidemiological studies indicate that they may aggravate, among other things, neurodegenerative disorders such as Alzheimer's disease and amyotrophic lateral sclerosis (ALS). However, a recent study by researchers at the Institute of Pathobiochemistry at the Medical Center of Johannes Gutenberg University Mainz (JGU) has produced no evidence that these fields can cause exacerbation or accelerated disease development in relevant mouse models. Neither learning behavior nor known disease mechanisms at the cellular level were affected.

The results of the study have been published in the journal *Scientific Reports* of the Nature Publishing Group.

The etiology of age-related neurodegenerative disorders such as Alzheimer's disease and [amyotrophic lateral sclerosis](#) is not yet understood. Less than 10 percent of patients have a matching family history, which means that the vast proportion of patients develop these diseases for so far unknown reasons. Age-related changes in metabolism, genetic predisposition, or environmental factors have been proposed as possible risk factors. In fact, according to the results of some [epidemiological studies](#), the low-frequency magnetic fields that are generated, for example, by the alternating current (50 Hz) in [power lines](#) and electrical appliances while they are operating, may promote the development of these diseases. Yet other studies claim that the exposure to magnetic fields does not represent a risk factor in connection with Alzheimer's disease or ALS. Although the current scientific data is inconclusive, the World Health Organization (WHO) has decided to categorize low-frequency magnetic fields as a possible risk factor in Alzheimer's disease.

In both Alzheimer's disease and ALS, there is progressive degeneration of neurons and thus loss of function of various groups of brain cells. "At

present, there is an extensive debate among the scientific community about how low-frequency magnetic fields might influence cell function at the molecular level," explained Dr. Albrecht Clement, principal investigator at the Institute of Pathobiochemistry at the Mainz University Medical Center. "To our knowledge, no comprehensive study has been conducted so far to investigate the long-term effects of these fields on the onset of disease symptoms and the progression of both diseases under controlled conditions."

In the current project, which was financed by the German Federal Office for Radiation Protection (BfS), the researchers have been able to demonstrate for the first time in a long-term study in relevant animal models that controlled exposure to low-frequency magnetic fields over a period of up to 18 months does not influence the onset and progression of Alzheimer's disease and ALS. A detailed analysis of the characteristic features of each disease showed that their development was in no way related to exposure to low-frequency magnetic fields. In the case of Alzheimer's disease, this also applied to the formation of pathological amyloid-beta protein plaque in the brain while in the case of ALS, there was no effect on the levels of proteins damaged by oxidative stress in the spinal cord. The inflammatory response in the nervous system that occurs in the course of both diseases was also unaffected during exposure. Moreover, neither learning behavior as an indicator of the progression of Alzheimer's disease nor the onset and the duration of ALS were influenced by the magnetic fields. "These results show that exposure to low-frequency magnetic fields has no effect on either disease-related molecular processes or on potential, as yet unknown, [disease mechanisms](#)," said Clement. "Our findings thus tend to confirm the results of previous epidemiological studies that indicate no damaging effects of low-frequency magnetic fields."

Nevertheless, extensive investigation is still necessary in order to clearly establish whether low-frequency magnetic fields have a pathogenic

potential in humans or not. The public interest in this issue is demonstrated by the fact that this study was funded by the Federal Office for Radiation Protection.

More information: "Low-frequency magnetic fields do not aggravate disease in mouse models of Alzheimer's disease and amyotrophic lateral sclerosis," *Scientific Reports* 5, 26 February 2015, [DOI: 10.1038/srep08585](https://doi.org/10.1038/srep08585)

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