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https://www.gesundheitsindustrie-bw.de/en/article/press-release/new-insights-cellular-mechanism-action-psilocybin

New insights into the cellular mechanism of action of psilocybin

A recent study by the Hector Institute for Translational Brain Research at the CIMH provides the first cellular insights into how psilocin promotes the growth and networking of human nerve cells.

The findings complement clinical studies on the treatment of mental disorders and could contribute to a better understanding of the neurobiological mechanisms behind the therapeutic effect of psilocybin.

Psilocybin is the well-known active ingredient in so-called magic mushrooms, which is converted in the body to psilocin – the compound that ultimately unleashes the psychoactive effect. The Mannheim research team worked directly with psilocin to investigate the neurobiological effects. In their current study, which has been published in the journal eLife, the researchers investigated its effect on human nerve cells that they had cultivated from stem cells. The result: even a single dose of psilocin was sufficient to induce various changes in human nerve cells within a short period of time.

More connections, more communication, altered gene activity

"What we observed is fascinating," explains Dr. Malin Schmidt, first author of the study. "The nerve cells formed more branches and produced more BDNF, an endogenous growth factor for nerve cells." What is even more astonishing is that synaptic changes persisted even after several days and communication between the nerve cells increased significantly.

The researchers were also able to prove that psilocin changes the activity of certain genes that are important for the brain's ability to adapt. This so-called neuroplasticity is reduced in many mental illnesses. "Put simply, psilocin makes the brain more malleable again," explains study leader Prof. Dr. Philipp Koch. "Our results provide explanations at the cellular level for the positive effects observed in clinical studies with psilocybin in patients with depression, addiction and post-traumatic stress disorder."

Better understanding of neurobiological mechanisms of action for new therapeutic approaches

The work complements the clinical studies already underway at the ZI and other research institutions worldwide, in which psilocybin is being investigated as a treatment option for various mental illnesses. "While clinical studies are investigating the efficacy in patients, our current work provides important insights into the underlying biological processes," emphasizes Koch.

The Mannheim researchers used the innovative iPSC technology (induced pluripotent stem cells) for their experiments. This makes it possible to grow functional nerve cells from human stem cells. "With this modern cell system, we can investigate the effect of substances directly on human nerve cells," emphasizes Koch. "This is an enormous advantage over conventional studies on animal models, as we can observe the processes in a fully human system."

The research results deepen the understanding of the neurobiological mechanisms of action of psilocybin and could help to further optimize psychedelic therapies that are already undergoing clinical trials. "With this better understanding of the cellular mechanisms, we may be able to take a more targeted approach and refine the therapeutic protocols," concludes Koch.

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Further information

- Central Institute of Mental Health in Mannheim (CIMH)