

Deep TMS



An FDA-approved, noninvasive, medication-free treatment option for major depressive disorder, obsessive-compulsive disorder, and smoking cessation.

In this unique technology transfer transaction, National Institute of Health (NIH) Office of Technology Transfer (OTT) licensed Deep Transcranial Magnetic Stimulation (Deep TMS), an NIH-developed technology, to a company co-founded by one of the inventors, and helped facilitate continued collaboration between the licensee and NIH to establish efficacy of the device in humans.

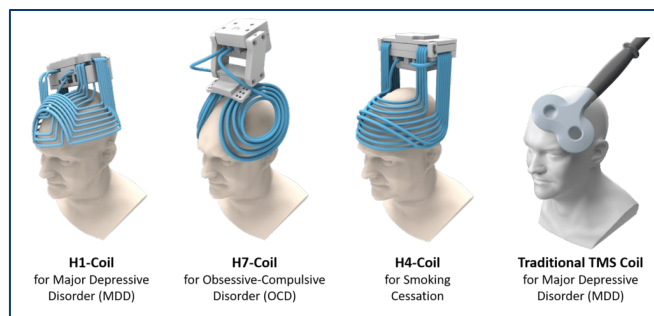
Discovery

Dr. Abraham Zangen joined the National Institute on Drug Abuse in 1999 as part of a postdoctoral fellowship. At the time, his research focused on treating drug abuse via electrostimulation on animals. Dr. Zangen wanted to translate his work to humans, so he connected with Dr. Mark Hallett at the National Institute of Neurological Disorders and Stroke (NINDS). They hypothesized that a new coil design could penetrate deeper than the standard Figure 8 coil that is traditional used for TMS. Dr. Zangen, with the help of physicist Dr. Yiftac Roth, Dr. Hallett, and NINDS visiting scholar Pedro Miranda, worked to design a new coil. They developed a coil that stimulates deep brain regions, such as the nucleus accumbens and the nerve fibers connecting the prefrontal cortex with the nucleus accumbens, as it plays a key role in mediating dopamine and dependent depressive behavior. Over several years, they developed a first-of-its-kind nonstandard TMS coil, the H-coil, which could induce neuronal activation in deeper areas of the brain without increasing stimulation intensity to unsafe or painful levels.

Role and Impact of Tech Transfer

OTT quickly moved to protect the intellectual property of the invention, submitting an invention report to OTT for the coil and a provisional patent application in 2000 titled "Coil for Magnetic Stimulation."

To continue his research on TMS, Dr. Zangen joined the Weizmann Institute in Israel in 2003. Shortly thereafter, he was contacted by Uzi Sofer, a well-known entrepreneur who had seen the technology advertised by NIH. Dr. Zangen, Dr. Roth, and Uzi co-founded BrainsWay, developed a plan for commercial development, and attracted investors. Later the same year, BrainsWay applied for an exclusive license from NIH to the patent estate covering the H-coil invention. NIH OTT personnel had to assess BrainsWay's commercial development plan and determine whether BrainsWay made a cogent case to predicate the granting of an exclusive license. After making this assessment, NIH OTT invited objections by publishing notice in the Federal Register indicting a prospective grant of an exclusive license. With no objections, NIH OTT crafted and negotiated the license agreement with BrainsWay,



Variations of the H-coil based off the technology licensed from NIH
Image source: [BrainsWay](#)

allowing BrainsWay an exclusive license that opened the door to future commercialization of the technology.

Even after Dr. Zangen left NIH, the continued collaboration between him and Dr. Hallett at NIH supported further development of Deep TMS. Following the finalization of the licensing deal, Dr. Zangen flew back to the United States to work with Dr. Hallett in his lab to conduct the first study using the H-coil on humans. This study ultimately demonstrated that the H-coil had significantly improved depth penetration and had a slower rate of decay of the electric field with distance than the standard figure-8 coil, allowing BrainsWay to move forward with clinical trials. After demonstrating that H-coils were well tolerated and that patients showed improved behavioral patterns and mood associated with depression in clinical trials, BrainsWay went on to receive their first FDA clearance in 2013 for the treatment of patients with MDD who fail to respond to medication.

Today, Deep TMS is FDA cleared to treat MDD, OCD, and smoking cessation. Deep TMS has also received the European CE certification mark for its treatment of several additional mental health and neurological conditions: Alzheimer's disease, autism, bipolar disorder, chronic pain, multiple sclerosis, Parkinson's disease, post-stroke rehabilitation, post-traumatic stress disorder, and the negative symptoms of schizophrenia.

An independent study found that a treatment regimen of Deep TMS combined with standard pharmacotherapy was significantly more effective than standard pharmacotherapy alone at reducing depression levels among patients with MDD.