An Hour of Light and Sound a Day Might Keep Alzheimer’s at Bay

Playing a flashing white light and a trilling sound reversed signs of Alzheimer’s in mice. Researchers are now trying it in humans

By Angus Chen on March 14, 2019
There is no cure for Alzheimer’s disease. Although a few drugs manage temporarily certain cognitive symptoms of the illness, none can stop or meaningfully slow its progression. “We really don’t have much to offer people,” says Shannon Macauley, a neuroscientist at Wake Forest School of Medicine. Virtually all new treatments have failed in clinical trials. “I think it’s a good idea to look beyond drugs to see what relief might come from,” she says.

Bathing patients in flashing light and pulsing sounds both tuned to a frequency of 40 hertz may reverse key signs of the illness, according to a paper published in Cell. “I think it’s an absolutely fascinating paper to be honest,” says Macauley, who was not involved in this work. “It’s a very provocative idea. It’s noninvasive and potentially easy and low cost, so if it were to come to fruition in humans—that’s fabulous.”
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In 2015 neuroscientist Li-Huei Tsai, director at The Picower Institute for Learning and Memory at Massachusetts Institute of Technology, was working on an experiment to manipulate brain activity by flashing a white light at these mice. Like light strobes, our brains flicker. Brain waves are generated when large groups of neurons oscillate on and off. Our thoughts and senses in this rhythmic electric current, or brain waves, can occur 40 times a second, or 40 hertz, and flash back to each other—generating gamma waves at a corresponding 40 hertz.

When Tsai flicked a light into the mice, the amount of amyloid plaques and tau tangles diminished. “It was the most remarkable thing,” she says. “The light flicker stimulation triggers a tremendous microglia response.” These are the brain’s immune cells that clear cell debris and toxic waste including amyloid. Disease, but [the light] seems to...
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centers of the brain. And there was about a 40 or 50 percent decrease in amyloid and tau levels. It’s an absolutely impressive feat.”

That showed when Tsai put the mice through a set of cognitive tests. In one, where the mice were given a familiar and an unfamiliar object to explore, mice that didn’t get the treatment acted as though they’d never seen the familiar object. “That shows some memory problems,” Tsai says. Mice that saw the light and heard the sound spent about two thirds of the time that untreated mice did examining the familiar object. “It was unbelievable,” Tsai says. “This is the first time we’ve seen that this noninvasive stimulation can improve cognitive function. It’s not a drug or an antibody or anything, it’s just light and sound.”

One possible explanation for this is brains with Alzheimer’s have irregular, often hyperactive, neurons, says Jorge Palop, a neurologist at the University of California, San Francisco, who did not work on the study. By providing the brains with a steady and regular beat, the repeating light and sound might work as a kind of metronome for brain activity. “This could be like resetting the mice every day and correcting some of this abnormal activity and then downstream of that are all these benefits.”
All of this is still at the level of speculation. Researchers simply do not know why these brain waves, specifically ones rising from light and sound stimulation at 40 hertz and no other frequencies, can lead to a reversal of Alzheimer’s disease symptoms. “That’s a mystery,” says Terrence Town, a neuroscientist, at the University of Southern California who was not involved with the work. It’s also not clear if these beneficial effects would appear or if 40 hertz is the “magic” frequency in humans, he says.

Tsai is already working on answering those questions. In human studies underway at Cognito Therapeutics, a start-up she founded with her colleague Ed Boyden, she says light and sound seem to increase gamma waves in healthy participants without negative side effects. “Nobody gets sick or even complains about it,” Tsai says. “But to see a [therapeutic] effect in humans, you’ll have to wait a long time. If this approach has an impact, the experiment could easily take five years to have some conclusive answer.”