How good night's sleep can brainwash away dementia

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Waves of fluid wash through the brain while we sleep, which could help stave off Alzheimer's ALAMY

It's well known that a good night's sleep is good for your health but it could also be the key to avoiding Alzheimer's — by quite literally brainwashing us.

Scientists have found that our brains are rhythmically rinsed in a watery fluid after we drift off each evening. The process, which is thought to play a part in keeping cognitive functions sharp, could offer the best explanation yet of why we need to rest and why a broken night's sleep leaves one foggy-headed. It could also help to flesh out the enigmatic association between sleep disorders and degenerative conditions such as Alzheimer's disease.

As scientists have struggled to find a drug to counter the effects of Alzheimer's, the link between sleep and dementia has become a focus for research. One study published in June suggested that analysing brain waves while we doze could be a means of diagnosing the condition, long before clinical symptoms become apparent.

The latest study was published yesterday in the journal *Science*. After monitoring 11 sleeping volunteers using MRI scans, scientists found that the process begins with brain cells reducing their electrical activity. A few seconds later, a certain amount of blood flows from the head into the body.

This leads to lower pressure, allowing a watery liquid, cerebrospinal fluid (CSF), to flow in. It appears to wash through the brain in rhythmic, pulsing waves. The study was the first to show this pulsing activity. It also revealed the close association with both brain wave activity and blood flow.

“We’ve known for a while that there are electrical waves of activity in the neurons,” Laura Lewis, an assistant professor of biomedical engineering at Boston University and a co-author of the paper, said. “But before now we didn’t realise that there are actually waves in the cerebrospinal fluid, too.”

The findings back up earlier studies, which have suggested that both cerebrospinal fluid and brain wave activity may help to flush toxic, memory-impairing proteins from the brain.

As people age, it appears that their brains tend to generate fewer, slower brain waves. This, in turn, may affect the blood flow in the brain and reduce the pulsing of cerebrospinal fluid during sleep, leading to a build-up of toxic proteins and a decline in faculties such as memory.

The team behind yesterday’s finding now plan to explore how the brain-washing process is controlled. “The neural change always seems to happen first, and then it’s followed by a flow of blood out of the head, and then a wave of CSF into the head,” Dr Lewis said.

One explanation may be that when the brain cells become less active they require less oxygen, so blood leaves the area. Pressure in the brain then drops and cerebrospinal fluid rapidly flows in to maintain pressure at a safe level.

“But that’s just one possibility,” Dr Lewis said. “What are the causal links? Is one of these processes causing the others? Or is there some hidden force that is driving all of them?”

Previous studies involving animals have indicated that one of the waste products removed from the brain during sleep is beta amyloid, a protein closely associated with Alzheimer’s disease. The brain-rinsing occurs during what is known as non-REM sleep soon after a person drifts off.