

# Here's why sleep deprivation is toxic and will eventually kill you

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You can live for about three minutes without air, three days without water and about 21 days without food. But in between food and water, there is something else critically essential: sleep.

It turns out you can only live about 11 days without sleep. You can give it a try if you don't believe me, but, just like the other essentials, after day 11 you will probably die.

Sleep is one of the most important things we overlook, because most of us don't consider it vital. The problem isn't you — it's your brain. Brain scientists really don't know what they are talking about when it comes to sleep. For far too long, we have known too little about why we sleep. Instead of acknowledging that fact, scientists have made up fairy tales to explain our need for sleep. They have guessed that sleep is necessary for creativity, rest, rejuvenation and recovery.

There are hints of truth to all of those explanations, but they don't give us the whole picture. It must be far more important to our survival given how dangerous it is to be asleep. Before we evolved into social animals with a knack for creating shelters, humans were at huge risk in the wild. Falling unconscious is the last thing a sapient Homo sapien would do to survive, unless sleep is really, really important. There are safer ways to rest than unconsciousness. And Picasso aside, creativity just isn't a primal survival tool.

So why sleep? Until now, my answer has always been don't, or at least do the minimal amount needed to function.

But new science has finally given us an answer to the mystery of sleep. In 2013, Danish scientists testing mice found that as animals sleep, their brains actually compress and grow smaller. Roughly 75% of our brain mass is water weight in the form of blood. Our brains receive energy from blood, so when the blood is pumping, our brains are plump. As we sleep, various parts of our brain shut down, and that reduced power consumption reduces

the swelling across our neurons. The brain's blood retreats, creating large empty spaces.

It is what happens next in the brain that makes sleep so vital to our survival. Our bodies leverage something called the lymphatic system to push out toxins. The lymphatic system mimics the flow of blood throughout our entire body and works to remove waste and byproducts as we consume energy. Blood is filled with nasty toxins, but our bodies take the good, and the lymphatic system excretes the bad. The lymphatic system works throughout the entire body with one exception: the brain.

The real estate in our heads is incredibly expensive. This leaves the brain so tightly packed that the skull can't accommodate a complex structure such as a lymphatic system. For years, scientists were convinced the brain was a tremendous recycler of waste: Rather than dispose of waste through the lymphatic system like the rest of our bodies, it was thought that we mysteriously reused byproducts, as if the brain subscribed to composting. In hindsight, it was a pretty stupid assumption. Recycling is expensive in terms of both energy and space, so there is no good reason why we would have evolved to expend effort to reuse junk when the good stuff was so abundant. But alas, scientists make educated guesses when we can't figure something out, and where all that waste went was a huge mystery.

Enter Danish scientists and their discovery about the brain shrinking when we sleep. As it happens, our cerebrospinal fluid — the stuff scientists thought was there solely to protect our brains from hitting our skulls — actually flows into and throughout the brain when we sleep to fill the void from the missing blood. As we cycle through five sleep stages roughly every 90 minutes, the cerebral fluid flows in and out, gently cleaning our brains of toxins. This is evolution at its finest: The brain takes aim at two birds, using the cerebral fluid both for protection and for cleaning.

It is the same concept used in our mouths, another area where the lymphatic system can't reach because it falls outside the blood system. The enzymes in saliva act as mouthwash, constantly cleansing our teeth, tongue and gums. We imitate this process when we floss.

When it comes to the brain, we have no artificial way to replicate nature. That's where sleep comes in, by reducing the brain's size to make room for

the mental mouthwash. The process of sleep very elegantly acts as a cleansing agent to remove the brain's toxins.

Without any sleep, toxins build up and kill us after about 200 hours. In the case of limited sleep, these toxins kill us over time. Lack of sleep is linked to far too many issues to fully list, including chronic fatigue, confusion, poor decision-making, irritability, headaches, weight gain, depression and heart disease. Sleep deprivation has also been linked to Alzheimer's, Parkinson's and other long-term degenerative brain diseases. Given we are talking about constipation of the brain, the negatives should come as no surprise.

The short-term issues are also pretty severe but again, largely misunderstood. People say they feel drunk or drugged when sleep deprived. Hogwash. You don't "feel" drugged; without sleep you ARE drugged. The brain is the single-best producer of mind-altering drugs. Artificial drugs are just an awkward human attempt to recreate what the brain does naturally. Pick your poison — cigarettes, caffeine, heroin, cocaine or even chocolate. All of these merely replicate what we already produce in our brains. The brain produces these drugs constantly, so if we don't purge ourselves from the resulting toxins, we remain drugged. Sleep is the only known cure. Without it, your mind is being overloaded like a drug addict clinging to their next fix.

Doctors are in agreement on the precise level of sleep needed — at least seven hours is necessary per night. Not five or six hours because you think you can handle it. That may be OK in the short term, but shortsighted thinking will kill you eventually. Sleep deprivation compounds, so every night counts. None of us are immune, no matter how busy or important you are. So the next time you start thinking about how to better yourself, improve productivity or stay ahead of the herd, lose the bravado and just go to bed.

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