



## Eliminate the Brain Drain: Take Out The Trash

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In a recent article, "Sleep Apnea and the Concussion Connection," we highlighted how concussions can negatively impact our body's ability to breath regularly while asleep. Beyond the obvious negative implication, a concussion can also have an undesirable impact on a vital process that supports proper brain health.

Specifically, there's a critical interplay between regular rhythmic breathing while asleep and the brain's ability to clear out metabolic waste products in an organized and predicted way. This process is often referred to as "washouts" or "brain cleaning." When someone gets a concussion, it impacts our body's ability to breath regularly while asleep and thus perform this process.

Gina Poe, PhD, a professor in the department of integrative biology & physiology at the University of California, Los Angeles (UCLA), uses a great analogy to help explain the process. She likens the washout scenario to having people over for a good conversation during a party (wakeful brain activity). After the party, the trash needs to be removed (washouts) from the place (brain) so you can have another good party the next day (functioning brain). When taking out the left over trash is skipped too often, the party

goers struggle to communicate due to the trash piled up all over the place (unremoved toxic byproducts). Ultimately, this makes it a lousy place to party.

In addition to concussions, two more conditions can negatively interrupt natural washouts: sleep interrupted by untreated sleep apnea and inconsistent bedtimes.

For untreated sleep apnea patients, scientists have found that they have toxic clusters of tau protein in their brains and measurable amounts of it in their cerebrospinal fluid (CSF) - just like Alzheimer's Disease patients and those with Chronic Traumatic Encephalopathy (CTE). That's important because CSF is critical to the proper functioning of the body and brain function, specifically washing out toxic clusters of tau protein, and interruptions can have significant negative consequences. Why? Each time a person inhales and their lungs fully inflate, pressure is exerted within their body that helps circulate cerebrospinal fluid, which among other functions, carries away metabolic waste products from the deep interstitial areas of the brain.

Inconsistent bedtimes can also be an issue. As noted, brain activity metabolic waste byproducts are known to flush out via CSF circulation all day, but most dramatically in the first hours of sleep onset. Researchers conclude that epinephrine levels (aka Adrenaline® in commercial form) are the primary determinant. Epinephrine levels are low when asleep, which is directly associated with shrinking the brain to open channels for cerebrospinal fluid flow. Conversely, this same chemical level is high during wakefulness, causing the brain tissue to expand and resulting in smaller openings for fluid to flush toxins away.

So what does that mean for people interested in clearing harmful toxins from the brain consistently?

1. **Treat sleep apnea.** Untreated apnea can cause many arousals early in the sleep cycle. When breathing stops, the body eventually understands smothering is happening; the fight or flight process kicks in with, among other strategies, an increase in epinephrine to wake you up and begin breathing. If these pauses in breathing happen in the first several hours of sleep, they can interrupt the washout process.
2. **Go to bed at the same time each night.** Gina Poe explains that research shows that if a person typically goes to bed at 10:30 PM but sometimes falls asleep an hour later, the body will skip the washout process window and get on with the next stage of sleep. The washout cycle is on a circadian keyed clock, not on a sleep onset process, so a consistent bedtime is important according to research conducted to date.

When individuals are treating any sleep apnea and mindful of hitting the sack at the same time every night, our cerebral festivities are much more fun. The metabolic waste

products are eliminated allowing party goers to effortlessly communicate, lending even more credence to the famous refrain: "You gotta fight... for your right... to party!"

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### **About the Co-Authors**

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