

Small Study Reveals How Poor Sleep Might Be Linked to Obesity, Diabetes

By ANDREA PETERSEN - The Wall Street Journal, October 16, 2012

Building on research linking inadequate sleep to obesity and diabetes, scientists in a new study say they have figured out for the first time how that connection might work at the cellular level.

In a small study published Monday in the *Annals of Internal Medicine*, researchers found that not getting enough sleep hurts the ability of fat cells to respond to insulin efficiently.

Fat cells safely store lipids. But when the cells fail to adequately respond to insulin, lipids can spill out into the bloodstream and surrounding tissue. This state of insulin resistance or "metabolic syndrome" is often a precursor to Type 2, or adult-onset, diabetes. Participants in the study who on four nights were in bed for 4½ hours had fat cells that were 30% less responsive to insulin than the cells were after four nights of 8½ hours in bed.

"If you're cramming for finals or have a newborn in the house," getting 4½ hours of sleep isn't unusual," said Matthew Brady, an associate professor of medicine at the University of Chicago and a co-author of the study. Yet after just four nights, "it is the equivalent of metabolically aging [participants] 10 to 20 years." The study involved seven thin, young, healthy people with an average age just under 24.

Most adults need between seven and nine hours of sleep a night, according to the National Sleep Foundation, a nonprofit research and advocacy group. But about a quarter of those ages 19 to 64 say they get less than seven hours on weeknights, according to the foundation's 2011 Sleep in America poll.

The study adds fuel to the larger scientific debate over the purpose of sleep. Sleep deprivation has been shown to reduce attention, slow reaction times and impair learning. This study shows it can be harmful to the metabolism, as well.

The study "substantially challenges the traditional views that the primary purpose of sleep is confined to restorative effects on the central nervous system," said sleep researchers Francesco P. Cappuccio and Michelle A. Miller of the University of Warwick in England in an editorial accompanying the study. Neither was involved in the study, which follows the publication earlier this month of separate research in the journal *Sleep* that found adolescents' resistance to insulin increased as the amount of sleep fell.

In the fat-cells study, the participants spent four days and nights at a sleep lab. Meals were controlled and exercise was curtailed. Naps and caffeine were forbidden. A month later, the participants spent another four days and nights at the lab.

During one stint, they were allowed to be in bed from 11 p.m. to 7:30 a.m. In the other, they were only allowed to be in bed from 1 a.m. to 5:30 a.m. After each four-day period, researchers took a tissue biopsy of belly fat.

After removing connective tissue, scientists divided the fat cells of each participant between several test tubes and exposed the cells to increasing levels of insulin. Researchers then measured the levels of phosphorylated enzyme Akt, an early indicator of insulin's effects.

Participants also underwent a "glucose-tolerance" test, where they were given glucose and then insulin intravenously to measure sleep's effect on insulin sensitivity in the whole body.

Sleep deprivation reduced whole-body insulin sensitivity by 16%, much less than the effect on fat cells specifically.

The researchers note that the study was very small and it is unclear if the results would be the same with the more likely scenario of people sleeping, say, six hours a night. There is also the possibility that making up for lost sleep—as people often do on weekends—could ameliorate some of the negative effects. Also, only one of the subjects was female. Some studies have shown that men and women respond to sleep deprivation differently.

Researchers are now planning a similar study looking to see if lengthening sleep time in obese, middle-age people with sleep apnea may improve the state of those people's fat cells.

"We took healthy people and made them worse," said Dr. Brady. "We'd like to see if improving sleep could have a beneficial effect."

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