

Study offers clues on why sleepless nights can contribute to weight gain

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An international team of researchers has found that a single sleepless night can alter metabolic processes leading to weight gain and lack of muscle maintenance. In their paper published in the journal *Science*

Advances, the team describes their study of the impact of a sleepless night on several volunteers.

Prior research has shown that interfering with normal sleep patterns can lead to weight gain—night shift workers, for example, have a tendency to gain weight. But until now, the mechanism responsible for such [metabolic changes](#) has not been known. To learn more, the researchers with this new effort enlisted the assistance of 15 adult volunteers. Each volunteer was tested in a lab on two separate occasions. One of the occasions was after getting a good night's sleep, the other was after the volunteer had stayed up all night. Each submitted blood, fat and [muscle](#) samples, which the researchers then studied looking for differences.

They found differences in gene activity linked to the production of proteins associated with [lipid absorption](#) and cell proliferation in the volunteers between the two visits. More specifically, they found that when volunteers missed a night of sleep, they had elevated levels of both metabolites and proteins that are involved in the process of storing fat. They also experienced a breakdown of proteins that are involved in muscle buildup and repair. The researchers also found that missing a single [night](#) of sleep caused changes to genes that have been associated with a type of inflammation linked to the development of type 2 diabetes and obesity.

The team reports that they do not know how long the metabolic changes lasted after the volunteers returned to normal sleep patterns. But they point out that their study shows that sleep serves more functions than previously thought—it is not just to rejuvenate the brain or to conserve energy, it also plays a role in overall metabolism. They suggest more study is required to determine if such changes due to episodic sleep disruptions become long-term.

More information: Jonathan Cedernaes et al. Acute sleep loss results

in tissue-specific alterations in genome-wide DNA methylation state and metabolic fuel utilization in humans, *Science Advances* (2018). [DOI: 10.1126/sciadv.aar8590](https://doi.org/10.1126/sciadv.aar8590)

Abstract

Curtailed sleep promotes weight gain and loss of lean mass in humans, although the underlying molecular mechanisms are poorly understood. We investigated the genomic and physiological impact of acute sleep loss in peripheral tissues by obtaining adipose tissue and skeletal muscle after one night of sleep loss and after one full night of sleep. We find that acute sleep loss alters genome-wide DNA methylation in adipose tissue, and unbiased transcriptome-, protein-, and metabolite-level analyses also reveal highly tissue-specific changes that are partially reflected by altered metabolite levels in blood. We observe transcriptomic signatures of inflammation in both tissues following acute sleep loss, but changes involving the circadian clock are evident only in skeletal muscle, and we uncover molecular signatures suggestive of muscle breakdown that contrast with an anabolic adipose tissue signature. Our findings provide insight into how disruption of sleep and circadian rhythms may promote weight gain and sarcopenia.

[Press release](#)

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