For effective weight maintenance, eat breakfast and stop late-night snacking

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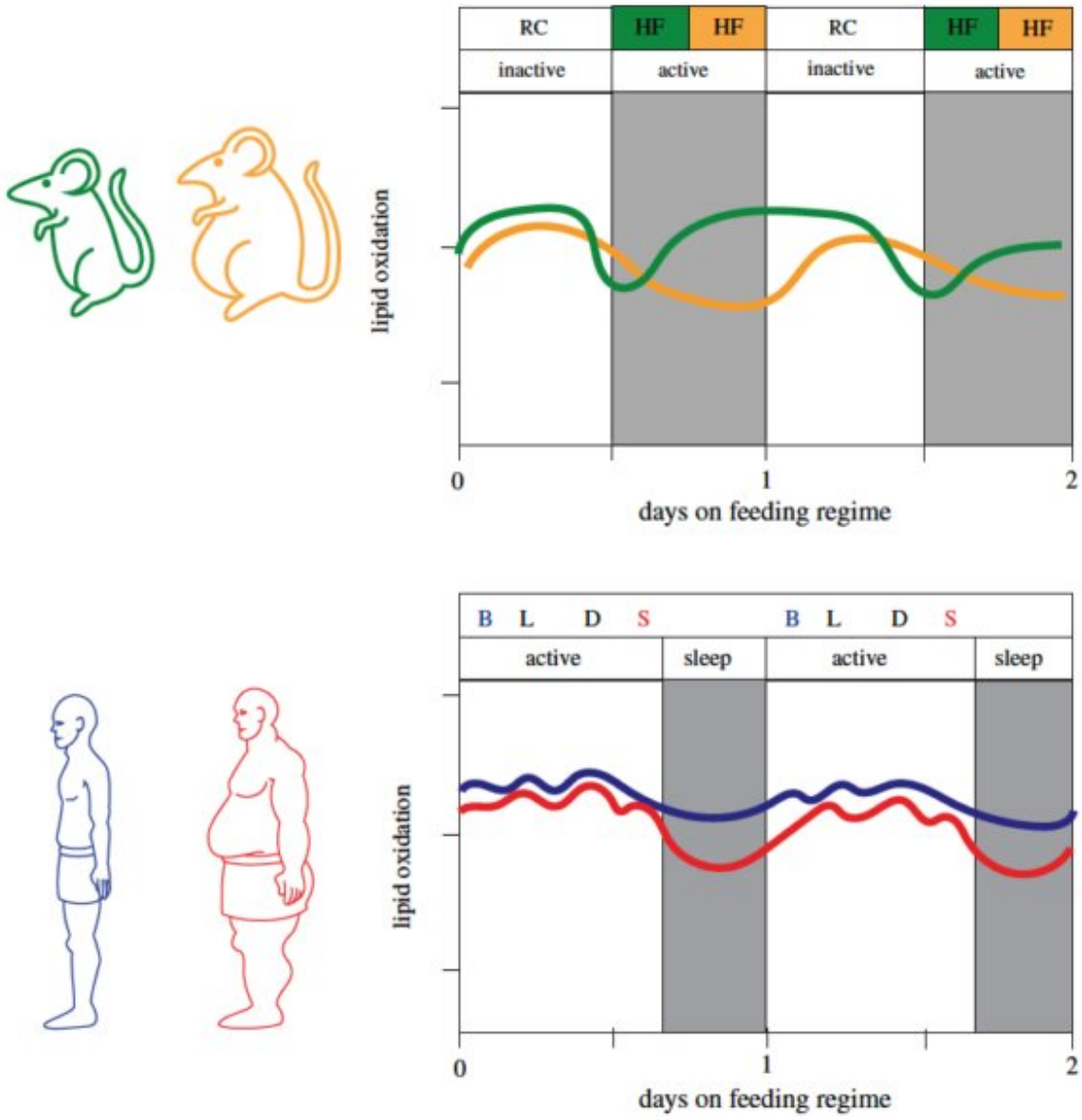

Eating when activity levels are high enhances lipid oxidation, thereby reducing fat accumulation. Credit: Kelly, Ellacott, et al.

Researchers have confirmed that due to daily circadian rhythms regulating metabolism, when you eat is as important as the how much and what you eat when trying to gain, lose or maintain weight.

Carl Johnson, professor of biological sciences at Vanderbilt University, collaborated with graduate student Kevin P. Kelly to test how the timing of daily meals and snacks throughout the day affects weight maintenance.

With 24-hour access to some food, those eating the biggest meal of the day in the morning gained less weight than those who ate their biggest meal at the end of the day and before sleep. "These differences are mostly due to natural differences in circadian metabolic regulation throughout the day," Johnson said. "We found that the timing of meals changes the proportion of fat the body is burning while sleeping, regardless of fasting."

Studies before this one have not isolated the variable of meal time because they have always included mandatory fasting periods. While past studies have demonstrated the importance of timing meals by periods of feeding and fasting, Johnson and Kelly found that even without fasting, the timing of large, high-fat meals still has a significant effect on weight gain.

These results, along with those from a previous study Johnson conducted, suggest that eating a larger, protein-filled breakfast is one of the best ways to maintain a healthy weight. A smaller but still significant change would be to avoid late-night snacking. Optimally, it is best to

avoid snacking between supper and bedtime so that when you fall asleep, your stomach is empty, Johnson said.

"If you do an enforced fast, the subjects did gain a little less weight, but not restricting access to food does not cause as much extra weight gain as we originally thought," Johnson said. "About 80 percent of the benefit of eating larger meals at the beginning of the day is present even if you do not have an enforced fast."

This novel research shows that timing of meals is important for weight maintenance regardless of fasting. "This is important because as humans, most of us have access to food 24/7," Johnson said.

Johnson plans to maintain his focus on circadian metabolism by looking into how it may affect those with the neurodevelopmental disorder Angelman syndrome.

The article, "Time-optimized feeding is beneficial without enforced fasting." was published in the journal *Open Biology* on Oct. 6. Former Vanderbilt psychology professor Martin Katahn pioneered the rotation diet that has been critical for this research, and researchers at the University of Exeter Medical School and Vanderbilt University Medical Center collaborated on this study.

Johnson has conducted additional research relevant to this topic in recent years. The article entitled "Eating breakfast and avoiding late-evening snacking sustains lipid oxidation" was published in the journal *PLoS Biology* in February 2020.

In that research, Johnson described the metabolic effects of eating the biggest meal of the day in the morning, compared with snacking before bed. "If you eat a large meal at the end of the day, your metabolism preferentially digests those carbohydrates instead of the fat reserves in

your body, which can lead to weight gain," Johnson said. "Our circadian rhythm wants to burn fat during the night when we are sleeping, but if you give your digestive system carbohydrates to burn by snacking between supper and bedtime, it will burn those easily digestible carbohydrates instead." The results from this informed some of the questions answered in his most recent work.

More information: Kevin P. Kelly et al, Time-optimized feeding is beneficial without enforced fasting, *Open Biology* (2021). DOI: 10.1098/rsob.210183

Kevin Parsons Kelly et al, Eating breakfast and avoiding late-evening snacking sustains lipid oxidation, *PLOS Biology* (2020). DOI: 10.1371/journal.pbio.3000622

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