# Fasting may benefit patients with epilepsy, study suggests

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Children with persistent and drug-resistant seizures treated with the high-fat, low-carbohydrate ketogenic diet may get an added therapeutic benefit from periodic fasting, according to a small Johns Hopkins Children's Center study.

The results, published online Dec. 3 in the journal Epilepsy *Research*, suggest the ketogenic diet and fasting can work in tandem to reduce seizures but appear do so through different mechanisms—a finding that challenges the longstanding assumption that the two share a common mechanism.

"Our findings suggest that fasting does not merely intensify the therapeutic effects of the ketogenic diet but may actually represent an entirely new way to change the metabolism of children with epilepsy," says lead investigator Adam Hartman, M.D., a pediatric neurologist at the Johns Hopkins Children's Center.

In the study, six children, ages 2 to 7, and all on the ketogenic diet, were asked to fast on alternate days. All six children had seizure disorders incompletely resolved by the diet alone.

Four of the six children experienced between 50 percent and 99 percent fewer seizures after the fasts were added to the dietary regimen. Three of the six were able to continue the fasting regimen for two months or longer.

The Johns Hopkins investigators say while the results are preliminary, they do provide compelling evidence of the potential benefits of fasting. Periodic fasts, they add, may eventually prove to be an alternative standalone therapy in children with drug-resistant epilepsy.

The researchers caution that larger studies are needed to further elucidate the effects of fasting. They also warn that fasting should be done under the strict supervision of a pediatric neurologist.

Made up of high-fat foods and few carbohydrates, the ketogenic diet is believed to work by triggering biochemical changes that eliminate seizure-causing short circuits in the brain's signaling system. The diet, popularized in the early 1900s, was designed to mimic the physiologic effects of fasting—a seizure-control method favored by ancient Greeks. Since then, physicians have believed that the two therapies share a common mechanism.

The new Johns Hopkins findings, however, suggest otherwise.

"We suspect that fasting affects nerve cells in a completely different manner from the ketogenic diet," Hartman says.

This hypothesis stemmed from a 2010 study of mice conducted by the Johns Hopkins team.

Two groups of epileptic mice—one treated with the ketogenic diet and one treated with fasting—had strikingly different responses to different seizure triggers. Animals treated with the ketogenic diet experienced fewer seizures than fasting mice when exposed to low amounts of electricity, but fared worse when they were injected with kainic acid, a potent nervous system stimulant and a known seizure trigger. Fasting mice, on the other hand, did worse when exposed to electricity but tolerated kainic acid injections far better than their ketogenic diet counterparts. In other words, the researchers say, each therapy protected against one seizure trigger, while increasing sensitivity to the other.

"We don't fully understand the reasons for these marked differences, but unraveling the mechanisms behind them will help pave the way toward new therapies for epilepsy, and is the focus of our ongoing work," says Eric Kossoff, M.D., pediatric neurologist and director of the ketogenic diet clinic at the Johns Hopkins Children's Center.

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