

Food or its expectation sparks brain's hunger centers

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The concept of whetting the appetite by serving hors d'oeuvres before a meal may have a solid scientific basis, according to a new report in the October issue of the journal *Cell Metabolism*, published by Cell Press. In a study of rats trained to a strict feeding regime, researchers found that brain activity in important hunger centers spiked with the first bites of food.

"The drive to eat is massively stimulated by the start of eating," said Gareth Leng of the University of Edinburgh, who co-led the new study with Louise Johnstone. "This shows the appetizing effect of food itself as hunger circuits are acutely switched on."

The imminent expectation of food also activated certain brain cells involved in stimulating hunger in the animals, they found. The rats' optimal window for consumption was brief, however, as brain centers responsible for registering satiety--the feeling of being full or satisfied--switched on almost as soon as food hit their stomachs, Leng said.

The new study is the first to chart the sequence of changes in brain activity over the course of a meal, according to the researchers.

The researchers provided rats with food for just 2 hours per day. After 10 days on the strict regimen, food intake and body weight stabilized, the researchers reported. Rats began eating simultaneously and voraciously as soon as food was presented and stopped eating about 90

minutes later despite the continued availability of food, an indication that the animals were full.

The rats were euthanized at defined times relative to the feeding schedule and their brains analyzed. The scientists measured acute shifts in brain activity by quantifying the level of "Fos," a protein product of the "immediate early" gene *c-fos*. Many neurons express *c-fos* when activated, Leng explained, with the Fos protein, it encodes rising within an hour of *c-fos* expression.

Before feeding, the animals' brains exhibited little Fos in most areas examined, they found. In important hunger-moderating brain regions, cells that contain appetite-stimulating factors known as orexigenic peptides showed increased Fos at the scheduled meal time whether food was presented or not, the researchers reported.

Surprisingly, brain cells that contain "anorexigenic peptides" responsible for a loss of appetite also contained Fos at meal time, though only in the presence of food. The researchers said the finding is an indication that "satiety" circuits activate coincidentally with food intake, rather than after a threshold intake is exceeded.

"We had expected there to be a clear temporal dissociation between brain regions activated by hunger, which would peak at the scheduled time of food presentation, and regions activated when the rats stopped eating," the researchers wrote.

"Instead, neurons that release orexigenic peptides appear to be activated by the imminent expectation of food, and neurons implicated in satiety are activated as soon as any food is eaten."

Further study is required to understand how these acute shifts in brain activity are influenced by hormones, such as the fat-generated hormone

leptin, that signal the body's longer-term energy status, Leng said.

Source: Cell Press

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