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Revealing the scientific secrets of why people can't stop after eating one potato chip

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The scientific secrets underpinning that awful reality about potato chips—eat one and you're apt to scarf 'em all down—began coming out of the bag today in research presented at the 245th National Meeting & Exposition of the American Chemical Society.

Tobias Hoch, Ph.D., who conducted the study, said the results shed light on the causes of a condition called "hedonic hyperphagia" that plagues hundreds of millions of people around the world.

"That's the scientific term for 'eating to excess for pleasure, rather than hunger,'" Hoch said. "It's recreational over-eating that may occur in almost everyone at some time in life. And the chronic form is a key factor in the epidemic of overweight and obesity that here in the United States threatens health problems for two out of every three people."

The team at FAU Erlangen-Nuremberg, in Erlangen, Germany, probed the condition with an ingenious study in which scientists allowed one group of laboratory rats to feast on potato chips. Another group got bland old rat chow. Scientists then used high-tech magnetic resonance imaging (MRI) devices to peer into the rats' brains, seeking differences in activity between the rats-on-chips and the rats-on-chow.

With recent studies showing that two-thirds of Americans are obese or overweight, this kind of recreational over-eating continues to be a major problem, health care officials say.

Among the reasons why people are attracted to these foods, even on a full stomach, was suspected to be the high ratio of fats and carbohydrates, which send a pleasing message to the brain, according to the team. In the study, while rats also were fed the same mixture of fat and carbohydrates found in the chips, the animals' brains reacted much more positively to the chips.

"The effect of potato chips on brain activity, as well as feeding behavior, can only partially be explained by its fat and carbohydrate content," explained Tobias Hoch, Ph.D. "There must be something else in the chips that make them so desirable," he said.

In the study, rats were offered one out of three test foods in addition to their standard chow pellets: powdered standard animal chow, a mixture of fat and carbs, or potato chips. They ate similar amounts of the chow as well as the chips and the mixture, but the rats more actively pursued the potato chips, which can be explained only partly by the high energy content of this snack, he said. And, in fact, they were most active in general after eating the snack food.

Although carbohydrates and fats also were a source of high energy, the rats pursued the chips most actively and the standard chow least actively. This was further evidence that some ingredient in the chips was sparking more interest in the rats than the carbs and fats mixture, Hoch said.

Hoch explained that the team mapped the rats' brains using Manganese-Enhanced Magnetic Resonance Imaging (MEMRI) to monitor brain activity. They found that the reward and addiction centers in the brain recorded the most activity. But the food intake, sleep, activity and motion areas also were stimulated significantly differently by eating the potato chips.

"By contrast, significant differences in the brain activity comparing the

standard chow and the fat carbohydrate group only appeared to a minor degree and matched only partly with the significant differences in the brain activities of the standard chow and potato chips group," he added.

Since chips and other foods affect the reward center in the brain, an explanation of why some people do not like snacks is that "possibly, the extent to which the brain reward system is activated in different individuals can vary depending on individual taste preferences," according to Hoch. "In some cases maybe the reward signal from the food is not strong enough to overrule the individual taste." And some people may simply have more willpower than others in choosing not to eat large quantities of snacks, he suggested.

If scientists can pinpoint the molecular triggers in snacks that stimulate the reward center in the brain, it may be possible to develop drugs or nutrients to add to foods that will help block this attraction to snacks and sweets, he said. The next project for the team, he added, is to identify these triggers. He added that MRI studies with humans are on the research agenda for the group.

On the other hand, Hoch said there is no evidence at this time that there might be a way to add ingredients to healthful, albeit rather unpopular, foods like Brussels sprouts to affect the rewards center in the brain positively.

More information: Abstract

Hedonic hyperphagia – eating for pleasure independent from hunger – is a phenomenon nearly everybody knows. Just imagine the attraction of chocolate, sweets or snack food like potato chips and the amount of these foods ingested without homeostatic need. In a feeding study with rats we tried to identify the active molecular compounds of potato chips associated with this phenomenon. Additionally, we mapped whole brain

activity patterns in rats linked to the intake of crushed potato chips, a mixture of fat and carbohydrates and standard chow. Significant differences became obvious concerning the behavior of the animals and the activation of distinct brain structures dependent on the ingested food. Main differences could be discovered in brain areas involved in systems regulating reward and addiction, food intake, sleep and locomotor activity. Despite of the highly attractive ratio of the components fat and carbohydrates, these ingredients seem not to be the only trigger.

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