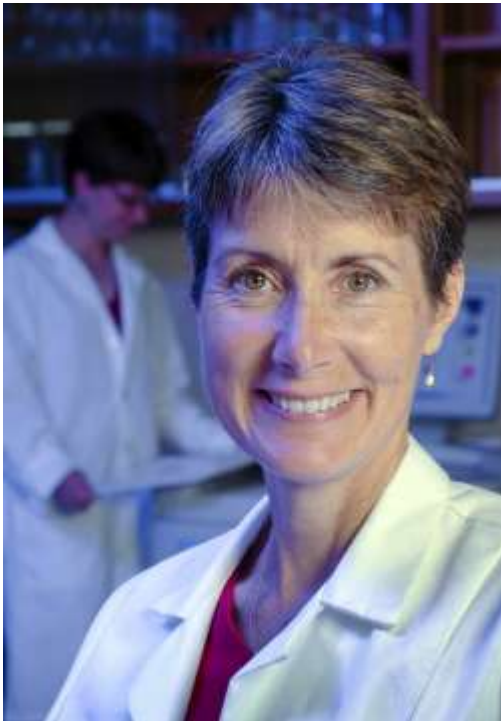


Media Relations

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UNH Research: Flame Retardants Found to Cause Metabolic, Liver Problems



Gale Carey, professor of nutrition, and her team of researchers found that laboratory rats that were exposed to polybrominated diphenyl ethers, or PBDEs, experienced a disruption in their metabolism that resulted in the development of metabolic obesity and enlarged livers in rats.

DURHAM, N.H. – Chemicals used as synthetic flame retardants that are found in common household items such as couches, carpet padding, and electronics have been found to cause metabolic and liver problems that can lead to insulin resistance, which is a major cause of obesity, according to new research from the University of New Hampshire.

“Being obese or overweight increases one's risk of many diseases including Type 2 diabetes, high blood pressure, coronary heart disease, stroke, gall bladder disease, osteoarthritis, sleep apnea and certain cancers,” said Gale Carey, professor of nutrition and the lead researcher. In 2003, overweight and obesity-related medical expenses were 9.1 percent of total U.S. medical expenses at about \$80 billion. New Hampshire's portion of this expense was \$302 million.

Carey and her team of researchers found that laboratory rats exposed to polybrominated diphenyl ethers, or PBDEs, experienced a disruption in their metabolism that resulted in the development of metabolic obesity and enlarged livers.

“Despite the plethora of resources devoted to understanding the roles of diet and exercise in the

obesity epidemic, this epidemic continues to escalate, suggesting that other environmental factors may be involved. At the biochemical level there is a growing body of experimental evidence suggesting certain environmental chemicals, or ‘obesogens’, could disrupt the body's metabolism and contribute to the obesity epidemic,” she said.

In Carey’s research, fat cells isolated from rats dosed with high levels of flame retardants daily for one month developed a sensitivity to hormones that was similar to the sensitivity experienced by people who are overweight: the fat cells became more sensitive to epinephrine and less sensitive to insulin.

“One of the hallmarks of somebody who is becoming diabetic – and often this accompanies weight gain – is that their fat cells become sluggish in their response to insulin. With epinephrine, the fat cells more easily release the fatty acids into the blood stream and if those fatty acids are not used, they promote insulin resistance,” Carey said.

“Those two features – insulin resistance and epinephrine sensitivity – are two features of fat cells from people who are above normal weight. And that’s what we were seeing in our rats. Even though our rats had not gained weight, they were experiencing ‘metabolic obesity,’” she said.

The cause of the flame retardant-induced insulin resistance is unknown but one possibility is the suppression of a key metabolic enzyme – phosphoenolpyruvate carboxykinase, or PEPCK – in the liver. Carey and her students found that the activity of PEPCK, which is responsible for sugar and fat metabolism, dropped by nearly 50 percent in livers of rats exposed to flame retardants for just one month, compared to controls.

“Because PEPCK regulates production of the backbone of the fat molecule, if the backbone isn’t made, the fatty acids that usually attach to this backbone have nothing to attach to. Their levels can rise in the liver and the blood. And it is elevated fatty acids that can lead to insulin resistance,” Carey explained. Indeed, the lab’s most recent findings demonstrated that the ability to create the backbone for the fat molecule was suppressed by 42 percent in liver tissue from rats treated with flame retardants compared to controls. In addition, rats exposed to flame retardants were found to have livers that were significantly larger than livers of rats that had not been exposed.

For more than 10 years, Carey and more than a dozen graduate and undergraduate students have collaborated with researchers from several universities and industries across the nation to examine the persistent organic environmental chemicals that could impact human health. “The average person probably has about 300 chemicals in her body that are manmade,” she said.

In a previous study, Carey and a graduate student examined the amount of flame retardant chemicals in breast milk. They found that the levels of these chemicals in breast milk are about two orders of magnitude greater than in European countries that do not allow the use of flame retardant chemicals.

The research is funded by the [NH Agricultural Experiment Station](#) at the [UNH College of Life Sciences and Agriculture](#). The results will be presented at the Experimental Biology annual meeting in Boston March 28-April 1, 2015.

Carey will discuss sugar metabolism at the Nashua [Science Café New Hampshire](#) as part of a program titled “The Science of Sugar” on Wednesday, Feb. 18, 2015. The free, two-hour event starts at 6 p.m. and will be held at [Killarney’s Irish Pub](#) in Nashua.

Founded in 1887, the [NH Agricultural Experiment Station](#) at the [UNH College of Life Sciences and Agriculture](#) is UNH’s original research center and an elemental component of New Hampshire's land-grant university heritage and mission. We steward federal and state funding to provide unbiased and objective research concerning diverse aspects of sustainable agriculture and foods, aquaculture, forest management, and related wildlife, natural resources and rural community topics. We maintain the [Woodman](#) and [Kingman](#) agronomy and horticultural farms, the [Macfarlane Greenhouses](#), the [Fairchild Dairy Teaching and Research Center](#), and the [Organic Dairy Research Farm](#). Additional properties also provide forage, forests and woodlands in direct support to research, teaching, and outreach.

The [University of New Hampshire](#), founded in 1866, is a world-class public research university with the feel of a New England liberal arts college. A land, sea, and space-grant university, UNH is the state's flagship public institution, enrolling 12,300 undergraduate and 2,200 graduate students.

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https://colsa.unh.edu/sites/colsa.unh.edu/files/images/gale_carey.jpg

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