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Chemical exposure could lead to obesity, study finds

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Exposure to chemicals found in everyday products could affect the amount of fat stored in the body, according to a study by University of Georgia researchers.

Phthalates are chemicals found in everything from plastic products to soap to nail polish—they give plastic its bendy stretch. But growing research shows that these chemicals could be harming people's health, said the study's lead author Lei Yin, an assistant research scientist in the UGA College of Public Health's department of environmental health science.

"Phthalate exposure can be closely associated with the rise of different types of disease development," Yin said.

Because levels of phthalates were found in human fluids in previous studies, the researchers wanted to see if a specific phthalate, benzyl butyl phthalate, or BBP, had an effect on the accumulation of fat in cells. Their findings were published in *Toxicology in Vitro*.

The researchers used mouse cells to create in vitro models to analyze how exposure to BBP affected the way oils and fats, known as lipids, accumulated within the cells.

"Obesity is one of the big issues in humans now, and of course genetic components can contribute to the development of obesity," said study co-author Xiaozhong "John" Yu, an assistant professor of environmental

health science. "However, environmental exposure may also contribute to obesity."

Some phthalates have proven to cause reproductive toxicity at high levels of exposure, but the link between low-level exposure and BBP hadn't yet been thoroughly explored, Yin explained.

"It could be that some chemicals at a very low dose and over a long period time, which is known as chronic exposure, can cause more harmful diseases or effects," she said.

The researchers quantified lipid droplet accumulation using traditional staining approaches, in which the cells are stained and therefore can be visually assessed under a microscope, and a newer approach called cellomics high-content analysis. This high-content screening uses "image processing algorithms, computer machine learning and can measure the multiple parameters in a fast and objective way," Yin said.

The results of BBP's effects were compared with bisphenol A, or BPA, an environmental endocrine disruptor that is known for its role in adipogenesis, or how fat cells develop.

BBP caused a response in the cells that is similar to BPA: Both chemicals prompt the accumulation of lipid droplets. However, the droplets from BBP-treated cells were larger, something that suggests BBP exposure may lead to obesity.

Although the findings cannot be directly generalized to the human population—Yu notes the cells used were mouse cells and a "human is not a big mouse"—they do give an indication of a possible link between exposure to BBP and obesity, something that could affect human health.

Calling obesity research a very exciting area to be studying, Yin said she

would like to explore the relationships between other environmental chemicals and obesity in future studies. She is also interested in learning if certain plant-based chemicals could counterbalance the negative effects of exposure to more harmful chemicals.

More information: Lei Yin et al, Benzyl butyl phthalate promotes adipogenesis in 3T3-L1 preadipocytes: A High Content Cellomics and metabolomic analysis, *Toxicology in Vitro* (2016). DOI: 10.1016/j.tiv.2016.01.010