Negative effects of plastic's additive blocked by nutrient supplements

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Experiments in animals have provided additional and tantalizing evidence that what a pregnant mother eats can make her offspring more susceptible to disease later in life.

This susceptibility is the result of a process that alters how a gene is expressed without actually changing or mutating the gene itself. Appreciation of this phenomenon has spawned a new avenue of genetic research known as epigenetics, a name which refers to changes happening over and above the gene sequence without altering its code.

In their most recent experiments, Duke University Medical Center investigators demonstrated that exposure within the womb to bisphenol A (BPA), an ubiquitous chemical used in the production of plastics, caused noticeable changes in the offspring without altering any of the offspring's genes. Additionally, the researchers discovered that administration of folic acid or genistein, an active ingredient in soy, during pregnancy protected the offspring from the negative effects of BPA.

The results of the study, which was supported by the National Institutes of Health and the Department of Energy, were published early online by the *Proceedings of the National Academy of Science* July 30.

In their experiments, the Duke team studied a well-documented strain of animals known as agouti mice. Normally, these mice tend to be slender and brown. While past epigenetic research at Duke has focused on

nutrients given to pregnant agouti mice, the current experiments represented the first tests of a potential environmental toxin.

The researchers found that when the mouse mothers received BPA, a statistically significant increase in the number of their offspring were born with a yellow coat. Previous studies with these mice have shown that yellow agouti mice are at a much greater risk for diabetes, obesity and cancer.

“The fact that the mice fed BPA had a yellow coat and likely would grow to be obese as adults demonstrates that this single substance had a system-wide effect,” said Dana Dolinoy, Ph.D., postdoctoral fellow in the laboratory of Randy Jirtle, Ph.D., senior member of the research team. “A comparison between the large yellow mice and the normal brown mice showed identical genetic makeup, yet strikingly different appearances.

“Just as importantly, when pregnant mothers were also given folic acid or genistein, the epigenetic influence of BPA was counteracted,” she added.

BPA is a synthetic estrogen first synthesized in the 1890s and is used in the manufacturing process from such everyday products as plastic water bottles, food containers and baby bottles. While laboratory studies have uncovered possible health concerns in animals, there has been considerable debate in the United States and Europe about what levels are considered safe for human consumption. Attempts have been made in Canada, California, Maryland and Minnesota to ban its use.

Jirtle, one of the leaders of epigenetics research, said that it is difficult at this point to determine what the levels of maternal BPA in humans would equal those that caused epigenetic changes seen in the mice. The levels of BPA used in the current experiments were five times lower

than that considered harmful for mice, showing that even a low exposure was able to cause noticeable effects in the offspring.

“Since BPA can be detected at some level in almost all humans, the current findings could hold the promise of reducing disease susceptibility by using nutritional approaches,” Jirtle said. “The ability of some agents to counteract the epigenetic effects of a toxin, in this case BPA, with maternal supplements has the potential to protect present and future generations.”

Genistein, which is readily available in health food stores, is an active ingredient in soy. It is possible, Jirtle said, that the reason Asians have much lower rates of obesity and certain cancers is that their diet typically includes greater use of soy products than Western diets. However, he pointed out, it is not known at what doses genistein would be protective or harmful in humans. Future studies would be needed to determine optimal doses.

“It’s like the findings that have suggested that one glass of red wine a day may be good for your cardiovascular system,” Jirtle said. “That may be true, but we certainly know a gallon of red wine a day is not good for you.”

Source: Duke University Medical Center