# Environmental toxin Bisphenol A can affect newborn brain

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Newborn mice that are exposed to Bisphenol A develop changes in their spontaneous behavior and evince poorer adaptation to new environments, as well hyperactivity as young adults. This has been shown by researchers at Uppsala University. Their study also revealed that one of the brain's most important signal systems, the cholinergic signal system, is affected by Bisphenol A and that the effect persisted into adulthood.

Our environment contains a number of pollutants, including Bisphenol A, which is used in plastics in a number of different applications. When plastic products are used, Bisphenol A can leak out, which is especially problematic as it is used in baby bottles, tin cans, plastic containers, plastic mugs, which are used by people of all ages. Both in Sweden and globally, Bisphenol A is widely used, and the substance has been found in human placentas, fetuses, and breast milk.

In recent years measurable amounts of Bisphenol have been found in dust from regular homes, but opinion differs regarding any negative effects of Bisphenol A, and risk assessments from various parts of the world present contradictory recommendations, even though the information used comes from the same research reports. Here in Sweden the Swedish Chemicals Agency and the Medical Products Agency are working on a ban for Bisphenol A in baby bottles and certain other plastic products.

In humans and mammals, the brain develops intensively during a limited

period of time. In human babies, this brain development period runs from the seventh month of gestation through the first two years of life. The corresponding period for mice takes place during the 3-4 first weeks after birth. Uppsala researchers have shown in previous research studies that various toxic compounds can induce permanent damage to brain function when they are administered to newborn mice during this developmental period. Examples of such compounds are so-called brominated flame-retardants, polychlorinated biphenyls (PCBs), and DDT.

In an entirely new study these researchers examined whether exposure to Bisphenol A during the neonatal period can cause permanent damage to brain function. In the experiment different doses of Bisphenol A were given to mice when they were ten days old. The mice underwent a so-called spontaneous behavior test as young adults, in which they were made to change cages from their well-known home cage to another identical one during one hour. Normal mice are very active during the first 20 minutes, exploring the new home environment. This activity declines during the next 20 minutes, and in the final 20 minutes it drops even more, and the mice settle down and sleep.

"In our study we found that a single exposure to Bisphenol A during the short critical period of brain development in the neonatal period leads to changes in spontaneous behavior and poorer adaptation to new environments, as well as hyperactivity among young adult mice. When this is examined again later in their adult life, these functional disturbances persist, which indicates that the damage is permanent and do not in fact disappear," says Henrik Viberg at the Department of Organism Biology.

Using the same behavioral method, it was also examined whether the individuals that had received Bisphenol A during their neonatal period reacted differently than normal individuals to adult exposure to nicotine,

which would indicate that one of the brain's most important signal systems, the cholinergic signal system, was affected. Normal animals exposed as adults to the given dose of nicotine experience dramatically increased activity compared with animals that were not exposed to nicotine. Animals that had been exposed to Bisphenol A during their neonatal period and then received nicotine as adults did not evince the same hyperactivity as normal animals at all. This indicates that the choligernic signal system had been affected and that these individuals had had developed increased sensitivity to this type of exposure in adulthood. Once again, this effect was induced during the neonatal period but persisted into adulthood.

"We have previously seen this type of effect from several other environmental toxins that are still prevalent in both indoor and outdoor environments. As these effects are similar to each other, it's possible that several different environmental toxins, including Bisphenol A, may work together in causing disturbances during brain development. This in turn may mean that the individual dosages of the various environmental toxins that are required to cause disturbances may be lower than those we examined in our studies of, for example, Bisphenol and brominated flame-retardants," says Henrik Viberg.

This research is published in the scientific journal *Toxicology*.

**More information:** Dose-dependent behavioral disturbances after a single neonatal Bisphenol A dose, Toxicology, In Press, Uncorrected Proof, Henrik Viberg, Anders Fredriksson, Sonja Buratovic, Per Eriksson doi:10.1016/j.tox.2011.09.006

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