Low-dose effect of developmental bisphenol A exposure on sperm count and behaviour in rats

Bisphenol A is widely used in food contact materials and other products and is detected in human urine and blood. Bisphenol A may affect reproductive and neurological development; however, opinion of the European Food Safety Authority (EFSA) on bisphenol A (EFSA J, 13, 2015 and 3978) concluded that none of the available studies were robust enough to provide a point of departure for setting a tolerable daily intake for bisphenol A. In the present study, pregnant Wistar rats (n = 17–21) were gavaged from gestation day 7 to pup day 22 with bisphenol A doses of 0, 25 μg, 250 μg, 5 mg or 50 mg/kg bw/day. In the offspring, growth, sexual maturation, weights and histopathology of reproductive organs, oestrus cyclicity and sperm counts were assessed. Neurobehavioural development was investigated using a behavioural testing battery including tests for motor activity, sweet preference, anxiety and spatial learning. Decreased sperm count was found at the lowest bisphenol A dose, that is 25 μg/kg/day, but not at the higher doses. Reproductive organ weight and histology were not affected and no behavioural effects were seen in male offspring. In the female offspring, exposure to 25 μg/kg bw/day bisphenol A dose resulted in increased body weight late in life and altered spatial learning in a Morris water maze, indicating masculinization of the brain. Decreased intake of sweetened water was seen in females from the highest bisphenol A dose group, also a possible sign of masculinization. The other investigated endpoints were not significantly affected. In conclusion, the present study using a robust experimental study design, has shown that developmental exposure to 25 μg/kg bw/day bisphenol A can cause adverse effects on fertility (decreased sperm count), neurodevelopment (masculinization of spatial learning in females) and lead to increased female body weight late in life. These results suggest that the new EFSA temporary tolerable daily intake of 4 μg/kg bw/day is not sufficiently protective with regard to endocrine disrupting effects of bisphenol A in humans.

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