THE EFFECT OF BPA ON GENE EXPRESSION

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ABSTRACT: The levels of the plastic chemical bisphenol A (BPA) that leach into food via plastic in packaging have been deemed safe for public consumption in a final report by the FDA (2014). However, scientists have recently began studying how BPA affects gene methylation. Gene methylation occurs when a methyl group (CH3) blocks RNA from reading the DNA code which causes the gene to be switched "off." When genes are not methylated, the gene is not blocked causing the gene to be turned "on." RNA can then use the DNA as a template to make proteins and other structures in the cell. Therefore, the gene is expressed. Methylation is a way for the body to control when the DNA template is read so that the function of the DNA is only expressed when needed. BPA toxins absorbed in the body are found to cause gene demethylation where genes are then overexpressed. Such a result can be a problem when heavily regulated genes are affected. For example, cancer can occur when genes coding for replication and growth are not controlled by methylation. Many scientists have quantified these effects, but their focus is isolated on one gene where implications are only applicable to that gene. This review compares the percent of methylation change of genes between four studies before and after the treatment of 50 µg/kg of BPA: Sox2 whose protein regulates embryonic development (Prins et al. 2017), β-Casein whose protein is found in milk (Altamirano et al. 2017), PGC-1α whose protein regulates cell metabolism (Jiang et al. 2015), and Dnmt1 whose protein produces methyltransferase (Ma et al. 2013). Sox2, PGC-1α, and β-Casein showed a decrease in methylation percent after treatment (Prins et al. 2017; Jiang et al. 2015; Altamirano et al. 2017). Dnmt1 was found to have increased in methylation. Ma et al. (2013) suggested that since methyltransferase causes methylation, a decrease in methylation could coincide with an initial decrease in methylation of Dnmt1. These findings support that BPA does decrease gene methylation. These findings could persuade the FDA to consider new regulations for standardizing BPA use. This knowledge also informs people's decisions on whether or not to avoid products containing BPA.

References

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