Phthalates and Phthalate Alternatives: Effects on Proliferative and Estrogenic Target Genes

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Phthalates are used as plasticizers in many consumer products found throughout the household. Little research has been conducted on the effects of these phthalates as potential endocrine disrupting chemicals. As these chemicals are ingested, the mechanisms by which they affect the female reproductive system are largely unknown. The purpose of this study was to observe how two phthalates, di-n-butyl phthalate and diisononyl phthalate, and two phthalate alternatives, dioctyl terephthalate and butylated hydroxytoluene, tested in conjunction with and without estradiol, affect uterine cells (Ishikawa cells) in comparison to the control and 17β-estradiol treatments. Reverse transcription polymerase chain reaction was used to observe changes in expression of target genes after cells were treated. The proliferation inducing target genes observed were C-myc and Cyclin D1. The estrogen-mediated target genes observed were Progesterone Receptor, Estrogen Receptor, WISP2, SDF-1, and PS2. Significance was determined using ANOVA test followed by Tukey's post-hoc test. Results show that all chemical treatments upregulated the proliferation-inducing genes and also led to upregulation in the majority of estrogen-mediated target genes. These results open up possibilities to classify the mechanisms of each of the phthalates and phthalate alternatives and provide evidence that these chemicals can be classified as potential endocrine disruptors based on the upregulation of proliferation-inducing and estrogen mediated genes. This supports the hypothesis that these chemicals can have negative effects on the female reproductive system. The results are applicable to public health in that the use of phthalates and phthalate alternatives in manufacture of consumer products should be limited.