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**REVIEW: The Effects of Parental Phthalate Exposure on Newborn Defects**

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Abstract
Phthalates, or phthalate esters, are employed in the making of numerous products around the world, such as food containers, children's toys, detergents, surfactants, household items, and even pharmaceutical tablets. With the flexibility, elasticity, and inexpensive price, companies started using phthalates without doubting their acute and chronic toxicity. Recent research suggests that phthalate esters are possible causes of asthma, obesity, type II diabetes, neurodevelopmental issues, heart diseases, cancer, and especially reproductive system issues. However, studies about the effects of phthalates on fetal development are rare. To summarize updated data on this field, this review poster covers the most prominent in vivo studies, both animal models and humans, regarding phthalates exposure during pregnancy to newborn defects. Additionally, novel hypotheses on molecular mechanisms and important suggestions are provided to minimize possible negative outcomes of phthalate applications.

This student presentation is available at ScholarWorks: https://scholarworks.boisestate.edu/under_showcase_2022/
**ABSTRACT**

Phthalates, or phthalate esters, are used in the manufacturing of thousands of products around the world, including food packaging, plastic bottles, cosmetics, and various household items. They are known to cause health issues, including endocrine-disrupting effects, reproductive problems, asthma, and other respiratory issues. Prenatal exposure to phthalates can alter development and leads to increased incidence of malformations, which can impact the health of future generations. This study aimed to investigate the effects of these substances on newborn development.

**RESULTS**

10 trustworthy papers were selected and reviewed. 4 articles are experiments on animals (Table 1), and the rest 6 articles are human studies (Table 2).

**DISCUSSION & CONCLUSION**

Through these recent publications, phthalates are proven to emerge a negative impact on fetal development. Postnatal exposure to phthalates is also shown to induce a high level of incidences. During pregnancy, there is a close connection between newborn malformations, including structural malformations (e.g., atrial septal defects, hydropsphrosis, anencephaly, lip/eft palate, pulmonary cystadenomas) and chromosome abnormalities (e.g., trisomy 21, trisomy 18, trisomy 13). Due to ethical issues, human studies are conducted based on questionnaires and phthalate metabolites from urine and cord blood. Therefore, there is not enough information about the human exposure dose. However, some cellular and molecular mechanisms are thanks to the advantages of biotechnology. Since phthalates can overcome the placenta barrier (8), it induces more oxidative stress, abnormal cell cycle and cell proliferation, impaired protein production and secretion pathways, bone formation decrease, and notochord signaling disruption in embryo development. Genetic experiments present a high correlation with shorter telomere size and dysregulation in DNA methylation of major developmental diseases (e.g., HMGCR, ME3G). It is believed that phthalate toxicity is more about gene expression regulation through epigenetic mechanisms rather than gene mutations.

More specific evidence is investigated in animal studies with the exposure dose of only 50 μg and 250 μg. Affected genes are different due to the study’s purposes, yet major embryo developmental genes are also found including bm2p, shr, collagen and rig.

To generate a more comprehensive picture, longer and larger studies, especially in humans, are essential to understand the mechanistic pathways of how phthalate most likely affects fetal genetics through cellular stress, mRNA, and DNA methylation.

From a study of HANES, thirteen phthalate metabolites are detected in the urine of 22% of 1,264 pregnant women (1). In early 2018, new data show evidence that phthalates are responsible for more than 90,000 death/year in America. Up to 71.7 billion people are lost per year. Further, although European Union (EU), US, Canada, China, Australia, and Israel banned some phthalates (DEP, DBP, DEHP) in toys and electrical equipment, major daily applications in pharmacy, consumer goods, and outbreaks of phthalates are still reported in developing countries such as Vietnam, Taiwan, and India.

WHO has called for the international community and governments should be put as a matter of citizens’ health. Guidelines are required for not only obtaining wider and clearer effects of phthalates, especially in fetal development but also for using and labeling phthalates in a better way.

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**REFERENCES**