PERSONAL CARE PRODUCTS: WHERE ARE THE PHTHALATES?

Tara Lunsford, Dr. Erika Doctor, Dr. Cassandra Korte
College of Arts and Sciences, Lynn University, Boca Raton, FL

Abstract

Phthalates are chemicals that are commonly used as a plasticizer in personal care products. This class of compounds is added to help prevent products from drying out. Phthalates have been shown to have potential negative impacts on reproductive organs, cause birth defects, effect the endocrine system, as well as causing other ill effects. For example, previous work found that phthalates can have an effect on the endocrine system of adolescent individuals. In an intervention study, phthalate exposure was reduced when these products were not being used. The purpose of the present study is to examine phthalate abundance in personal care products and to design an intervention study to lessen exposure.

To identify products containing phthalates, we used the Environmental Working Group's Skin Deep cosmetic database. This database contains personal care products and their ingredients. We used the database to identify products that contain phthalates and the type of phthalates used. The most commonly used phthalate is polyethylene terephthalate, with it currently found in 610 products, with 314 of which are nail polish. There are also 12 other kinds of phthalates that are regularly used in personal care products, ranging from lipstick to sunscreen. We can see that there are still a multitude of products that contain potentially harmful phthalates. This study is the foundation to future work looking at exposure to phthalates in adult populations and assessing sources of exposure from personal care products.

Introduction

Phthalates are used to enhance the flexibility of plastics, making them common throughout personal care products such as nail polish and lip products. For example, phthalates are used to keep nail polish from drying out and becoming brittle and are used as solvents for perfumes and lubricants (Witorsch & Thomas, 2010). As the majority consumer of these kinds of products, women are at more risk of exposure to these chemicals (Harley et all, 2016). Phthalates can enter the body through a multitude of ways, such as dermal application of personal care products containing phthalates or inhalation of air containing phthalates (Witorsch & Thomas, 2010).

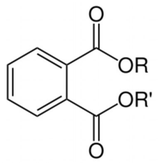


Figure 1: The chemical structure for a basic phthalate

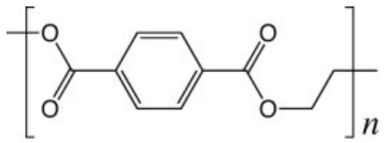


Figure 2: The chemical structure for polyethylene terephthalate

A previous study looked at associations between women who used personal care products within 24 hours before a urine sample was taken and the concentrations of phthalate metabolites in their urine. They reported results where the women that used personal care products, such as nail and lip products, containing phthalates had a 2.08 times higher ratio of metabolite concentration than women that did not used those products previous to the urine collection. This increase looked at monoethyl phthalate (MEP) which had the strongest association between personal care product usage and urinary concentration in this study (Parlett et al, 2012).

Our study was done to show how commonly phthalates are found in products that get used every day. This will allow us to narrow our focus in future work to the most abundant phthalates. In addition, the database, Skin Deep, will give information about the types of products where prevalence is high, helping to reduce the number of products to be examined in future exposure studies.

Results

FIGURE 3: PRODUCTS CONTAINING POLYETHYLENE TEREPHTHALATE

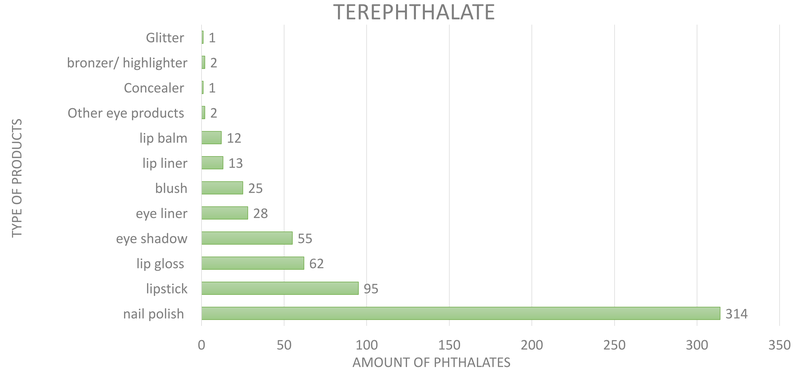


FIGURE 4: TYPES OF PHTHALATES FOUND WITHIN PRODUCTS

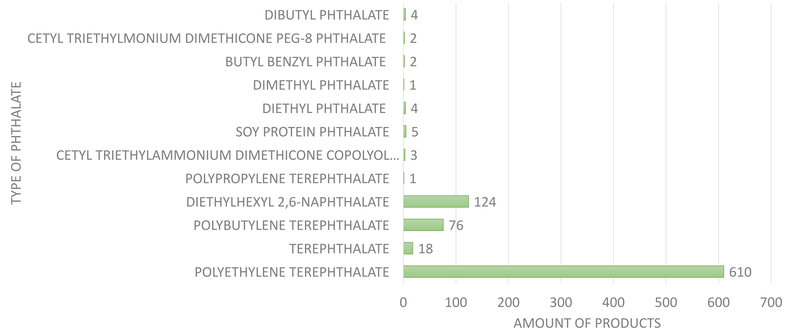


FIGURE 5: TYPES OF PHTHALATES FOUND IN NAIL POLISH

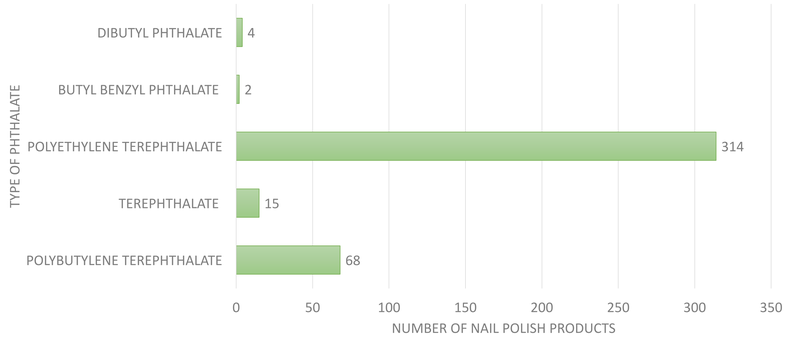
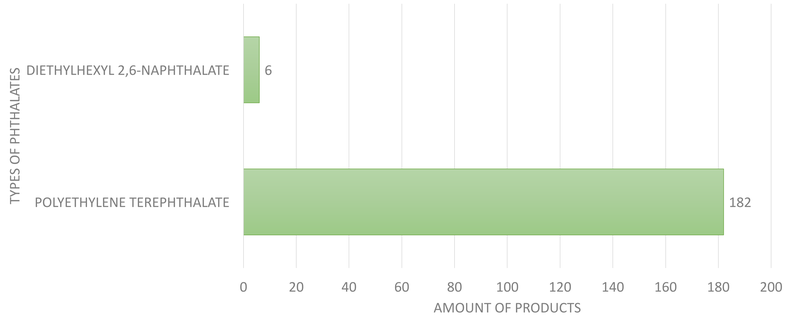


FIGURE 6: TYPES OF PHTHALATES FOUND IN LIP PRODUCTS



Materials

The online database ewg.org/skindeep was used to collect data. This is The Environmental Working Group's Skin Deep cosmetic database. This resource features products and their ingredients and allows the public to search by either. This website is consistently being update and revised. The data was collected on January 2, 2018. To narrow the search, the keyword "Phthalate" was entered into the search bar. The database then gave all the recorded products that contained phthalates of all types. This was then put into a spreadsheet, separating the products by type of phthalate, type of products and most commonly occurring phthalate.

Discussion

The most commonly found type of phthalate in personal care products was polyethylene terephthalate. This phthalate was found the most heavily in nail polish and lip products. In a previous study done on women's exposure to phthalates in relation to the use of personal care products , it was found that women had greater exposure to phthalates with nail products than they do lip products (Parlett et al, 2012). The amount of phthalate present per gram of creatinine in urine was measured. For monoethyl phthalate, when the urinary excretion was measured, women that used nail products had nearly double the concentration of MEP metabolites in comparison to women that did not use nail products. Nail polish gave 156.60 µg/g while lip products produced a level of 85.06 µg/g. This means that there was more MEP in women's urine due to the nail polishes than lip products (Parlett et al, 2012).

Our work found that polyethylene terephthalate was the most prevalent in personal care products, which this previous study did not examine . This is also not an expected result. The lip products would seem to be a greater source of exposure due to the mouth being a more direct route into the body than through the nail. This difference could be due to the amount of phthalate initially in the product or due to prolonged exposure with nail products. In the future, we plan to study the amount of phthalates in nail and lip products and how usage of these products can affect subsequent exposures. Based on these findings, our focus will be on the most prevalent type of phthalate that we identified, polyethylene terephthalate.

References

Harley, K. G., Kogut, K., Madrigal, D. S., Cardenas, M., Vera, I. A., Meza-Alfaro, G., She, J., Gavin, Q., Zahedi, R., Bradman, A., Eskenazi, B., and Parra, K. L. (2016). Reducing Phthalate, Paraben, and Phenol Exposure from Personal Care Products in Adolescent Girls: Findings from HERMOSA Intervention Study. *Environmental Health Perspectives.*

Parlett, L. E., Calafat, A. M. & Swan, S. H. (2012). Women's exposure to phthalates in relation to use of personal care products. *Journal of Exposure Science and Environmental Epidemiology.*

Witorsch, R. J., and Thomas, J. A. (2010). Personal care products and endocrine disruption: A critical review of the literature. *Critical Reviews in Toxicology.*