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## The Influence of Education of Hazardous Cosmetic Chemicals on Teenage Consumerism

### Behavioral & Social Science

Cancer is a word we hear all the time, and the number of people who are expected to fall to it is only predicted to increase [1]. In response, more and more people are learning how to lower their risk through some recommended practices, such as exercising and eating a more balanced diet. However, what we expose our skin to, whether those are chemicals in our environment or substances we apply to our skin, has shown potential to lead to increased risk of developing breast cancer.

Our skin can absorb substances and products that it has been exposed to which eventually makes its way into our blood, urine, and sweat. As a result, certain ingredients that may cause harm to us do make their way into our systems. One such category of these ingredients are xenoestrogens.

Xenoestrogens are foreign substances that mimic the function of estrogen, which is a female hormone necessary for puberty, development, and pregnancy. Xenoestrogens, through their molecular similarity to estrogen, can interfere with the body's natural hormonal activities and potentially lead to neurological harm, reproductive toxicity, and breast cancer. Xenoestrogens are present in the environment and even in everyday body and beauty care products.

The focus of this study was to make teenage girls aware of xenoestrogens found in cosmetics and beauty products, specifically parabens, phthalates, triclosans, and oxybenzone. All four of these have been linked to hormonal disruption in humans, reproductive issues in rats, and damage to maritime ecosystems. This will be done through a presentation educating the girls about xenoestrogens and their potential harm, along with follow-up surveys to see if the girls were taking into consideration the information given to them.

## Background

Parabens are one of the xenoestrogens that this study focused on. Parabens are typically used as antimicrobial preservatives in a wide range of other products, but also have oestrogenic and other hormone related activity. It has been previously suggested that parabens and other chemicals in underarm cosmetics may contribute to the rising incidence of breast cancer” [2]. In previous studies with rats, parabens were found to mimic estrogen which led to increased sensitivity to estrogen and decreased production of testosterone in their offspring [3]. Parabens have also been found to increase human breast cancer proliferation [3].

Phthalates are added into cosmetic and beauty products for the purpose of making products “scented”. However, along with smelling great, they have also been found to cause potential endocrine disruption even at low concentrations [4]. Metabolites in phthalates have been associated with infertility, decreased levels of testosterone and sperm, and underdeveloped reproductive organs [3]. As a result of their association with such reproductive damage, they have been banned in products in all markets in the European Union.

Triclosans are antibacterial microbes that are found, for example, within toothpaste, deodorants, and shaving products. They have been linked to hormonal disruption in the thyroid and the gonads and have been detected in breast milk, urine, and sebum (oil gland secretions on the face). Triclosans have been shown to play a role in cancer development through its ability to mimic estrogen [5]. Triclosans have also been found to have devastating effects on marine ecosystems, killing plants, algae, crustaceans, and fish [3].

Oxybenzone is an emerging estrogenic and environmental contaminant that is found in sunscreens, hair products, and creams. But instead of staying on the skin, it penetrates through and accumulates in organs, where it has been implemented as an endocrine disrupters [6]. It has also been found to cause DNA damage in fish and bleaching in corals; as a result, it has now been banned from

resorts in Hawaii and other maritime areas. Oxybenzone, in pools and waterways, has been shown to react with chlorine present in there for antimicrobial purposes and create hazardous by-products.

As a part of the presentation, I included many resources, such as websites and apps that helps consumers select safer beauty products. For example, one app is Think Dirty, which lists certain cosmetic brands that they verify as “safe”. Other websites, such as the Environmental Working Group (EWG), have a database of cosmetic products that they have analyzed on a scale of 1 to 10 in terms of safety with 1 being the least hazardous and 10 being the most.

### Methodology

Since this study involves human subjects, it will first be reviewed by an Institutional Review Board (IRB) Board. Consent forms will be designed as to ensure that the participants are aware of what they will be agreeing to do, along with any risks, benefits, or requirements. Since the participants are minors, parent consent forms will also be designed and signed. After IRB approval is granted, female students from grades 9-12 will be randomly asked to take part in this study. Each will be fully informed about the study and that fact that her participation is voluntary.

Once 12 girls will have agreed, they will meet together one day for the presentation described above. Following that, they will be given a survey once every month for the next three months to determine the success of their understanding of xenoestrogens and how to limit their exposure to them. To ensure that the girls’ information is kept private, surveys will be conducted via an online source, called Survey Monkey. Survey Monkey allows for responses to private surveys be kept anonymous through a selected setting called Anonymous Responses. With this option, no IP Adresses or names are recorded, only the duration of the survey-taking. The participants recieved the survey through a QR Code sent through a Remind, which is an app that allows for the researcher to send out reminders with a select group of people who signed up through a code. The names of those who signed up will not be known to anyone.

### Cited Sources

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