How Can Cosmetics Cause Breast Cancer?

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Abstract: There are approximately 157 million women in America, many of which use cosmetic products daily for anti-aging treatments and overall charismatic improvement in physical appearance. Breast cancer is the second most diagnosed cancer among women in America, slightly trailing behind skin cancer. The research scientists, oncologists, and dermatologists of today have neglected the possible correlation between these cytologic illnesses and the daily behaviors of American women. This research paper is designed to promote awareness among American women and physicians so that modern women are educated on the role of their daily routine in breast cancer development. The integrity of cosmetic products is founded by common ingredients such as parabens, retinol, and even soy. The daily exposure of these potentially toxic substances can result in hormone imbalances, mitotic disruptions, genotoxic influences, and collagen overproduction. Due to these circumstances, the prognosis for most cosmetic-consuming, modern women is grim in terms of breast carcinogenesis.

Index Terms: Breast Cancer, Cosmetics, Parabens, Retinol, Soy, Vitamin A, Dermatology, Oncology

1 Introduction

According to the Interagency Breast Cancer and Environmental Research Coordinating Committee, inherited factors leading to breast carcinogenesis only attest up to 25% of all breast cancers so the majority of breast carcinogenesis in modern day is a result of environmental factors (Schwarzman et al., 2015). The current established noninherited factors leading to breast carcinogenesis includes exposure to estrogenic compounds or other substances that possess hormonal effects. In addition, there are also substances that result in direct genetic damage (Schwarzman et al., 2015). The human skin has infinite responsibilities, such as protecting the body from external substances that might harm the biochemical integrity of the human body (Cipriano & Kirby, 2014). In order to perform these tasks, our cutaneous composition includes the epidermis, dermis, and subcutaneous tissue. The epidermis is comprised of mostly keratinocytes (cutaneous cells that produce keratin), although the epidermis itself is distributed into multiple layers, including the stratum corneum. In order for a cosmetic or cosmeceutical to function properly, the chemical and biochemical substances contained within the product must have the competency to pass through the stratum corneum of the epidermis (Levin, Del Rosso, & Momin, 2010). A cosmeceutical product is defined as “a cosmetic product in which the active ingredient is meant to have a beneficial physiological effect due to an enhanced pharmacological action when compared with an inert cosmetic” (Levin, Del Rosso, & Momin, 2010). Essentially, this means that cosmeceuticals contain ingredients with biochemical effects on the body, resembling medicinal actions, rather than an average skin product that isn’t chemically active. In modern cosmetic products, many ingredients are added to produce anti-aging effects in addition to the cosmetics sole purpose. Parabens are one of these common added ingredients.

2 Cosmetic Substances That Initiate Cancer

2.1 Parabens

Parabens are found in numerous cosmetic products. In cosmetics, parabens are permitted in concentrations of up to 1% (Elder, 1984). In 1984, it was estimated that parabens were used in 13,200 different cosmetic formulations (Elder, 1984) and a more recent survey of 215 cosmetic products found that parabens were used in 99% of leave-on products and in 77% of rinse-off cosmetics (Rastogi et al., 1995). Based on animal studies, parabens concluded to be absorbed, metabolized, and excreted through skin. Parabens are additionally known to quickly absorb through the skin but cosmetic preparations can aid in this process. Therefore, the combination of substances found in modern day cosmetics and the parabens found within those cosmetics are aiding in the cutaneous absorption process of parabens. An assemblage of reports have sufficed as evidence supporting that parabens have the ability to cause chromosomal aberrations. Interestingly, the insertion of methylparaben cutaneously, results in adenocarcinomas in rats (Mason et al., 1971). From cytologic angles, parabens efficiently disrupt cellular function (Bairati et al., 1994) and entice mitochondrial dysfunction (Nakagawa & Maldeus, 1998). Through clinical assays, parabens have shown to increase the growth of human breast cancer cells (Okubo et al., 2001; Byford et al., 2002; Darbre et al., 2002, 2003). Parabens possess estrogenic characteristics and because estrogen is known to entice breast carcinogenesis, the inference can be made that the presence of parabens can also lead to breast carcinogenesis. Clinical evaluation has shown that in terms of rats, parabens only exerted estrogenic characteristics when inserted subcutaneously, failing when administered orally (Routledge et al., 1998; Hossaini et al., 2000; Darbre et al., 2002, 2003). This assay provides the supported inference that parabens might only contribute to breast cancer when introduced to the body through the skin via cosmetics. The most frequent ingredient for anti-aging purposes used in leave-on cosmetic products would be retinol, a generation of retinoids.

2.2 Retinol

Retinoids are chemical compounds that are derivatives of vitamin A. Retinoids work by initiating the skin to rapidly turn over cells, killing old cells in order to boost new cell growth (Mukherjee et al., 2006, p. 327-348). Retinoids are generally used for a plethora of biological processes including embryogenesis, reproduction, vision, growth, inflammation, cellular differentiation, proliferation, and apoptosis. Using specifics, retinol is essential and unique to rhodopsin pigment, actively used in vision (Roos et al., 1998). They also stimulate collagen production and thicken deeper layers of the skin, also known as the source of wrinkles. In addition, retinoids correct pigmentation related issues by sloughing off brown spots and curbing melanin development. Retinoids are action-packed substances because furthermore, retinoids are essential influences to

multiple cytologic processes too, including cell surface alterations and even immune modulations (Mukherjee, 2006, p. 327-348). The clinical effects of retinoids and retinoid derivatives, such as retinoic acid, retinyl esters, retinol, retinaldehyde, and oxoretinoids, include the reduction of skin roughness, wrinkles, hyperpigmentation, and fine lines. The ability to produce these effects includes decreasing the activity of enzymes that break down collagen and increasing cell turnover (Levin, James, Del Rosso, & Momin, 2010, p. 22-41). The production of new skin cells doesn't exclude substandard cells, cutaneous cell turnover (initiated by retinoids) has potential for both healthy and cancer cells. As stated previously, retinoic acid promotes collagen which can potentially lead to abnormal cell growth (cancer). This is because collagen changes cellular microenvironment which releases biomechanical signals leading to the eventuality of a profusion of biological events (Fang, Yuan, Peng, & Li, 2013). In addition to collagen's influence on cellular microenvironment, collagen also increases breast density. Clinicians have long recognized the connection between breast density and breast cancer risk (Wolfe, 1976, p. 2486-2492). Unfortunately, retinol and associated forms are not the only harmful ingredients present in modern cosmetics, neither are natural "non-chemical" substances, such as soy, safe either.

2.3 Soy

Soy is simply a protein derived from soybeans. The major components of soy include phospholipids. In addition, soy is also a phytoestrogen. Phytoestrogen is a plant compound with a weak estrogenic effect (Levin, Del Rosso, & Momin, 2010, p. 22-41) and that being said, each time soy is introduced to the human body via cosmetics estrogen is essentially being introduced unknowingly. In terms of breast carcinogenesis, soy operates in four ways. The first is the simple presence of soy (phytoestrogen). Estrogen is essential to the development of breast cancer because breast cancer is a hormone-dependant cancer (Rice & Whitehead, 2006, p. 995-1015). The second method of operation is the increase in glycosaminoglycans when soy is introduced to the human body. Glycosaminoglycans are heteropolysaccharides found in mammalian tissue (Afratis, 2012, p. 1177-1197). Recent cytologic studies revealed that glycosaminoglycans are important macromolecules with influences on cell integrity, including cellular growth (Afratis, 2012, p. 1177-1197). The interactions between growth factors and glycosaminoglycans, as well as cytokines, are extremely important in carcinogenesis. Essentially, glycosaminoglycans are involved in cellular signaling processes that induce cancer development and advancement (Afratis, 2012, p. 1177-1197). The third method of soy-based carcinogenesis entails soy's ability to increase the amount of hyaluronic acid in aging human skin (Levin, Del Rosso, & Momin, 2010, p. 22-41) which has the ability to entice cell motility, potentially leading to cell malfunction (cancer development). The fourth and final method that soy-based breast carcinogenesis functions would be the increased production of glutathione when soy is present (Levin, Del Rosso, & Momin, 2010, p. 22-41). Glutathione is active in a number of biological and cellular processes, including cell differentiation, proliferation, and apoptosis (Traverso et al., 2013). These processes are all active in the etiology of cancer and overall disease (Traverso et al., 2013). According to recent biomedical research, elevated presence of glutathione increases the resistance to oxidative stress, a common characteristic of most cancer cells (Traverso et al., 2013). This being stated, there is no coincidence that heightened glutathione levels are present among various types of tumors and cancers (Calvert, Yao, Hamilton, & O'Dwyer, 1998, p. 213-224; Estrela, Ortega, & Obrador, p. 143-181).

3 Conclusion

Likewise, there is no coincidence that ingredients in cosmetics that penetrate the skin to alter cells in order to produce charismatic femininity would induce cancer development (cellular process). Each day countless women begin their day by applying cosmetics without really knowing what the ingredients entail or how this small amount of foundation could've meant life or death. The modern woman should be educated on the fact that blush, mascara, foundation, and many more is potentially the cause of countless cases of breast cancer diagnosed each year. The ingredients found in a variety of cosmetic products (parabens, retinol, and soy) are linked to countless methods of breast carcinogenesis including the enticement of pernicious substances (hyaluronic acid and estrogen) to litter the human body and the inclination of cytologic malfunctions (mitochondrial dysfunctions and chromosomal aberrations). In conclusion, cosmetics that beget breast cancer development are simply constructed using substances that are introduced with positive intentions but fail to be recognized as inimical, nonetheless too much of a positive commodity can become negative.

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