



Do deodorants/underarm cosmetics cause cancer?

Deodorantlar/koltuk altı kozmetikleri kansere neden olur mu?

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Abstract

The effect of deodorant use on breast cancer development has generated considerable interest in both the scientific community and the mainstream media. Primary observational studies and numerous reviews investigating the effect of regular deodorant use on breast cancer development have been undertaken. There is no consensus in this regard. Some epidemiological studies have attempted to directly address the issue of underarm cosmetic use and breast cancer. On the other hand, many studies found no association between antiperspirant use and the risk of breast cancer. There is no difference in the current use of antiperspirant/deodorant products between breast cancer patients and nonaffected matched controls. There is no scientific evidence or research data that ingredients in underarm antiperspirants or deodorants cause cancer.

Keywords: Deodorant, underarm cosmetic, breast cancer, cancer, personal care, side effects, parabens, parahydroxybenzoic acid, triclosan, aluminum-based compounds

Öz

Meme kanserinin gelişiminde deodorant kullanımının etkisi, hem bilim dünyasında hem de medyada ilgi odağı olmuştur. Düzenli deodorant kullanımının meme kanserinin gelişimi üzerindeki etkisini araştırmak amacıyla çok sayıda derleme ve gözlemsel çalışma yapılmıştır. Bu konuda genel bir uzlaşma sağlanamamıştır. Bazı epidemiyolojik çalışmalarda, meme kanseri ve koltuk altı kozmetik kullanımı konusuna doğrudan değinilmiştir. Diğer yandan birçok çalışmada, meme kanseri riski ve antiperspirant kullanımı arasında ilişki bulunmamıştır. Meme kanseri hastaları ve etkilenmemiş kontroller arasında güncel antiperspirant/deodorant kullanımından kaynaklanan bir fark yoktur. Koltuk altına uygulanan antiperspirantlarda veya deodorantlarda bulunan maddelerin kansere neden olduğuna dair bilimsel bir kanıt ya da araştırma mevcut değildir.

Anahtar Kelimeler: Deodorant, koltuk altı kozmetikleri, meme kanseri, kanser, kişisel bakım, yan etkiler, parabenler, parahidroksibenzoik asit, triklosan, alüminyum bazlı bileşikler

Introduction

The effect of deodorant use on breast cancer development has generated considerable interest in both the scientific community and the mainstream media¹. It has warned that underarm antiperspirants or deodorants cause breast cancer².

Primary observational studies and numerous reviews have been undertaken, investigating the effect of regular deodorant use on breast cancer development. To date, the evidence has been largely inconclusive, with evidence of both protective³ and harmful⁴ effects of deodorant use, whereas

other researchers have failed to find an association between the two⁵. Although the exact mechanism behind any such relationship has not yet been identified, hypotheses have focused primarily on the anatomical location of the tumors and in vitro evidence of carcinogenesis¹ and estrogenicity⁶. Darbre found an increasing incidence of tumors in the upper, outer quadrant of the breast and hypothesized that deodorant application to the axilla may contribute^{7,8}. However, alternatively, the increased proportion of breast tissue in the upper, outer quadrant of the breast could explain the higher incidence of breast tumors in this quadrant⁹.

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To further supported this hypothesis, it is demonstrated that parabens, a constituent of deodorant, have estrogenic potential⁸. Because estrogen is a major etiologic factor in the development of human breast tissue and breast cancers, Darbre proposed that parabens and other chemicals that are used in underarm cosmetics may contribute to the increasing incidence of breast cancer¹⁰. Parabens have been shown to be weakly oestrogenic *in vitro* in a battery of tests including yeast and two human breast cancer cell lines (MCF7 and ZR-75-1). They are also oestrogenic in two mammalian species (the mouse and rat)¹¹. In reviewing these reports, the point must be made that the dose levels observed to produce effects, particularly *in vivo*, are high (several hundred mg kg⁻¹ body weight), indicating that parabens are weak oestrogens, and there is assumed to be a large margin of safety between these doses and the exposure to these chemicals from normal underarm cosmetic use¹².

Often substances have been reported to be endocrine disruptors (EDs) based on the results of screening tests¹³. Indeed, a considerable number of *in vitro* (sub-cellular or cellular) and *in vivo* (animal) screening tests for hormone-like activities of substances have been developed¹⁴. However, these tests were established for the purpose of screening, i.e. in order to prioritise toxicological testing of substances that may possess hormonal activities. Given that screening tests do not identify toxicity, they cannot determine whether a substance is an ED or not. Screening tests do not even assure that a substance will produce a hormonal activity in humans or other organisms; they merely suggest that the test substance may have such a potential. Therefore, when a substance produces changes in hormone-related parameters in screening tests, this means that the test substance has a biological activity, but it does not mean that it is toxic or is an ED. This view is also supported by a recent position of the European Food Safety Agency¹⁵. Indeed, there are more than a thousand natural or synthetic substances that have been found to be positive in screening assays and to possess weak hormone-like activities without causing actual toxicity at the individual or the population level. Weak hormonal activity can be advantageous, detrimental or neutral for the organism. To illustrate this: a change in room temperature, a meal or daylight may induce changes in circulating levels of hormones, such as thyroid hormones, insulin or melatonin, respectively¹⁶. This does not mean that these innocuous factors should be considered to be EDs. Similarly, our food is full of hormonally active substances: for example, soy contains substances (isoflavones) that possess powerful oestrogenic activity in screening assays, which have been shown to produce adverse reproductive effects in animal toxicity studies^{17,18}. Thus, by definition, soy isoflavones, such as genistein, are genuine EDs. However, isoflavones do not produce oestrogenic effects in humans or nonhuman primates at dietary levels¹⁹. Moreover, Asian populations with a high dietary intake of soy or soy-based food tend to have lower cancer rates of reproductive organs or breast, when compared with European or US populations²⁰.

Parabens, the alkyl esters of parahydroxybenzoic acid (methylparaben, ethylparaben, propylparaben, n-butylparaben, and isobutylparaben), continue to be widely used as antimicrobial preservatives in products used by humans, including most of the cosmetics (body creams, antiperspirants, suncare products, lotions, or shampoos) and pharmaceuticals, but also food²¹. Although parabens are used in many cosmetic, food, and pharmaceutical products, according to the FDA, most major brands of deodorants and antiperspirants in the United States do not currently contain parabens²².

The belief that parabens build up in breast tissue was supported by a 2004 study, which found parabens in 18 of 20 samples of tissue from human breast tumors²³. However, this study did not prove that parabens cause breast tumors²⁴. The authors of this study did not analyze healthy breast tissue or tissues from other areas of the body and did not demonstrate that parabens are found only in cancerous breast tissue. Furthermore, this research did not identify the source of the parabens and cannot establish that the buildup of parabens is due to the use of deodorants or antiperspirants²³.

In 2012, Barr et al.¹³ measured paraben levels in different regions of healthy breast tissue (without cancer). Except propylparaben (which was observed at higher levels in the upper outer quadrant compared with other breast regions), the other parabens had similar concentrations in different breast regions¹³. They also found similar concentrations of parabens in the breast tissue of women who reported to be current, past, or nonusers of underarm cosmetics. It suggests that parabens originate also from other sources than underarm cosmetics¹³. It is possible that these chemicals enter the body via skin application of any other body care product and parenterally from food or medicines taken by patients^{13,25}. Several European studies have confirmed the presence of parabens in urine, blood, human milk samples, and semen in the European population. It is also possible that systemically absorbed low-dose chemicals might accumulate and result in diffusion to the breast region^{13,25-27}. However, the above clinical studies did not establish a clear correlation between parabens and breast cancer development²⁸.

Aluminum-based compounds are used as the active ingredient in antiperspirants. These compounds form a temporary plug within the sweat duct that stops the flow of sweat to the skin's surface. Some research suggests that aluminum-based compounds, which are applied frequently and left on the skin near the breast, may be absorbed by the skin and cause estrogen-like (hormonal) effects may contribute to the development of breast cancer²⁹.

In a study, which was used a sensitive quantification technique to detect aluminum concentrations, similar aluminium concentrations were detected in the central and peripheral regions of breast tumors, and in normal tissues. In addition, it wasn't detected significant differences in aluminum concentrations as related to the location of the breast tumor within the breast, or to other relevant tumor features such as stage, size and steroid receptor status³⁰.

Neither is there clear evidence to show use of AI containing underarm antiperspirants or cosmetics increases the risk of breast cancer³¹.

Triclosan [TCS] is a broadspectrum antimicrobial agent that has become one of the most common additives used in deodorants. It has been hypothesized that repeated exposure of xenoestrogens, such as triclosan, to underlying breast tissue may be a risk factor³². However, triclosan's ability to behave as an estrogen antagonist also suggests that its presence in the body alongside estradiol may actually lower risk for cancer development^{33,34}. However, whether triclosan raises or lowers risk of cancer through estrogen-related pathways, and possible effect modification by estradiol, have not been examined in human studies³⁵.

It is important to note that Darbre (2003) has forwarded a logical and constructive hypothesis that can be tested empirically and calls for further research¹⁰. It must be reaffirmed so that science moves forward by proposing hypotheses that can be tested in a controlled

manner. In forwarding such hypotheses, scientists must balance the responsibilities of alerting to potential health effects (which may be subtle, e.g. dependent on early life exposures, or cause effects in sensitive subgroups that also have a predisposition due to other factors, or indeed individual chemical effects may be masked or confounded when in a mixture) against the anxiety generated by an ultimately unfounded health scare¹².

Darbre and Harvey reported two epidemiological studies have attempted to directly address the issue of underarm cosmetic (containing parabens and aluminium) use and breast cancer^{10,12}. On the other hand, many studies found no association between antiperspirant use and the risk of breast cancer^{3,5,13,22,24-28,30,31}. There was no difference in the current use of antiperspirant/deodorant products between breast cancer patients and nonaffected matched controls²⁸.

Mirick *et al.*⁵ to conduct a 'population-based case-controlled' study investigating the relationship between the use of products applied for underarm perspiration and the risk of breast cancer in women aged 20-74 years by retrospective interview of 813 case patients and 793 controls. They report no increase in risk of breast cancer following the use of antiperspirants/deodorants or an effect of shaving⁵.

In 2006, researchers examined antiperspirant use and other factors among 54 women with breast cancer and 50 women without breast cancer. The study found no association between antiperspirant use and the risk of breast cancer; however, family history and the use of oral contraceptives were associated with an increased risk of breast cancer³. However, researchers at the National Cancer Institute (NCI), a part of the National Institutes of Health, are not aware of any conclusive evidence linking the use of underarm antiperspirants or deodorants and the subsequent development of breast cancer. The U.S. Food and Drug Administration (FDA), which regulates food, cosmetics, medicines, and medical devices, also does not have any evidence or research data that ingredients in underarm antiperspirants or deodorants cause cancer²². In a study, in which fifty-nine studies resulting from the literature search were reviewed and nineteen articles with various methodologies were selected for indepth analysis, the expert group's conclusion coincides with those of the French, European and American health authorities. No scientific evidence to support the hypothesis was identified and no validated hypothesis appears likely to open the way to interesting avenues of research³⁶.

Finally, There are no agreed consensus of everyone in this regard. There is no evidence or research data that ingredients in underarm antiperspirants or deodorants cause cancer. There is no difference in the current use of antiperspirant/deodorant products between breast cancer patients and nonaffected matched controls.

Ethics

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: Serap Öztürkcan, Design: Serap Öztürkcan, Data Collection or Processing: Serap Öztürkcan, Analysis or Interpretation: Serap Öztürkcan, Fatmagül Keleş, Literature Search: Serap Öztürkcan, Fatmagül Keleş, Writing: Serap Öztürkcan, Fatmagül Keleş.

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