



Personal care products that contain estrogens or xenoestrogens may increase breast cancer risk

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Received 15 September 2006; accepted 20 September 2006

Summary Established models of breast cancer risk, such as the Gail model, do not account for patterns of the disease in women under the age of 35, especially in African Americans. With the possible exceptions of ionizing radiation or inheriting a known genetic mutation, most of the known risk factors for breast cancer are related to cumulative lifetime exposure to estrogens. Increased risk of breast cancer has been associated with earlier onset of menses or later age at menopause, nulliparity or late first parity, use of hormonal contraceptives or hormone replacement therapy, shorter lactation history, exposure to light at night, obesity, and regular ingestion of alcohol, all of which increase circulating levels of unbound estradiol. Among African Americans at all ages, use of hormone-containing personal care products (PCPs) is more common than among whites, as is premature appearance of secondary sexual characteristics among infants and toddlers. We hypothesize that the use of estrogen and other hormone-containing PCPs in young African American women accounts, in part, for their increased risk of breast cancer prior to menopause, by subjecting breast buds to elevated estrogen exposure during critical windows of vulnerability *in utero* and in early life. These early life and continuing exposures to estrogenic and xenoestrogenic agents may also contribute to the increased lethality of breast cancer in young women in general and in African American women of all ages. Public disclosure by manufacturers of proprietary hormonally active ingredients is required for this research to move forward. © 2006 Elsevier Ltd. All rights reserved.

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Introduction

Patterns of breast cancer are enigmatic. Most cases occur in women with few established risk factors [1]. The Gail model was developed from a nested case–control study conducted on a cohort of white women who were receiving regular screening mammograms in order to calculate multivariate relative risks of breast cancer based on age at menarche, age at first live birth, number of first-degree relatives (mother and sisters) with breast cancer, number of breast biopsies, and whether or not atypical hyperplasia was present on any biopsy specimen. This model was not intended to predict risk in women under age 40, nor in African American women of all ages [2].

Breast cancer incidence, morbidity and mortality vary across age, ethnic, geographic and racial groups, suggesting that there are different underlying risks and susceptibilities. For all age groups combined, African American women are less likely to develop breast cancer than white women, but at any age, they are more likely to die from it. In contrast, African American women under age 40 have a higher incidence of breast cancer than do whites (15.5 new cases per 100,000 woman-years versus 13.0 per 100,000, respectively). Incidence for African American women ages 20–29 years is nearly 50% higher than for white women of the same age (6.5 per 100,000 versus 4.4 per 100,000) [3]. For all ages combined, African American women also suffer a higher breast cancer mortality rate compared to white women at 34.7 deaths per 100,000 woman-years versus 30.7 per 100,000, respectively [4]. Simply stated, compared with white women, African American women have a higher incidence of breast cancer at younger ages and greater mortality at all ages [5].

In younger women, breast cancer is more aggressive, more deadly, and often less responsive to treatment than in older women [6–11]. Higher breast cancer mortality rates among African American women as a group can only partially be ascribed to later stage at diagnosis, lower percentage of localized disease, larger and possibly more aggressive tumors, and estrogen receptor negative tumors [12]. In fact, African American women appear to be more often diagnosed with a basal subtype of breast cancer that are more aggressive. Despite advances in screening and treatment for post-menopausal breast cancer, progress against the disease in younger women has not followed suit. Among other considerations, this indicates that cancer in younger women may be caused by different factors compared to cancer in

older women [12], or at the least the relative importance of the risk factors may differ according to age. Whether or not there are underlying avoidable risk factors that may account for differences in morbidity and mortality for breast cancer among different ages of ethnic and racial groups is a matter that merits serious examination.

Accepted risk factors for breast cancer include: age at menarche, age at menopause, age at first live birth, number of first-degree relatives with breast cancer, benign breast disease, breast biopsy outcomes, hormone replacement therapy, specific gene mutations, survival of childhood cancers treated with radiation (particularly thyroid cancers and Hodgkin's disease), adult weight gain, lack of exercise, obesity, radiation exposure, and excess alcohol consumption [1,12–14]. These risk factors, however, cannot explain variations in breast cancer incidence and mortality among different ethnic groups. African American women under the age of 35 differ from white women in terms of breast cancer risk factors that suggest they should have lower rates of the disease [1]. Thus, although African American women tend to have more children earlier in life, and this is protective against breast cancer in white women, earlier parity may not afford this same protection for African Americans.

Several reports have documented the more frequent and longer term use of PCPs containing hormones or placenta by African Americans compared with white women. For treatment of hair and skin, African American females may begin using PCPs that contain hormones as infants and toddlers, and they also may be exposed *in utero* when their mothers use these products during pregnancy. These xeno-hormone-containing products are often used with heat, which can enhance penetration and absorption. If estrogens have been used as growth promoters in animal production, then exposure to estrogen may also occur through dietary exposure by eating hormone-enhanced animal protein (beef, chicken). Compared with other ethnic groups, most of the evidence suggests that the use of hormone-containing PCPs by African Americans of all ages is more prevalent. Characterization of the amount and type of products currently used by African Americans and the biological consequences of exposure to hormones contained in these PCPs may lead to the identification of agents that contribute to African American breast cancer risk.

Several reports have established that estrogen-containing or placenta-containing PCPs resulted in premature sexual development [15–19] in infants or toddlers. In one case report, the use of ointment containing estrogens on the diaper area caused

early sexual development in an 8.5-month-old child [20]. Recent reports indicate that the premature sexual development in children may result from the use not only of estrogen-containing PCPs, but also those that contain placenta [21,22]. Exogenous hormones, including contraceptives and hormone replacement therapy, are also relevant to breast cancer risk. These risk factors, however, cannot explain variations in breast cancer incidence and mortality among different ethnic groups [1,23].

Several case studies have established that children who show early sexual development following exposure to estrogen from products applied to the skin or ingested through foods have variable serum hormone values. For instance, although some children with premature thelarche show high basal values of sex hormones at the time of diagnosis, the majority of children have basal values within a normal range [20,24,25]. This variation in serum hormones with premature sexual development may be due to: the variable half-life of hormones in the blood, discontinuing the use of the hormone-containing PCPs prior to obtaining a blood specimen, irregular use of the PCP, or the use of the PCP in quantities that would produce biological effects but not cause changes in blood hormone levels or different individual susceptibility to hormones. In addition, constant exposure to low levels of exogenous hormones may produce biological effects. Occasional peak exposures that are not detectible months after they occur may also produce effects. It is clear that the biological consequences of estrogen exposure may persist long after the serum estrogen levels return to normal [15]. Furthermore, as infants or toddlers, African American girls may begin using hair products containing hormonal substances and they also can be exposed *in utero* when their mothers use these products during pregnancy. While dietary exposures to hormone or hormone-mimicking compounds in animal proteins may also be relevant, the variability in exposure to hormones in food eaten by African Americans compared with whites requires further study. The use of estrogen-containing PCPs by African Americans, however, may constitute a more specific preventable etiological risk factor for breast cancer.

Children, in particular African American girls, are experiencing declining age of onset of secondary sexual characteristics and earlier onset of puberty compared with their white counterparts [26,27]. The proportion of girls who experience early sexual maturation is nearly four times greater at age 8 for African American than for whites (48.3% and 14.7%, respectively) [27]. The reasons for this

Table 1 Widely used personal care products that contained estrogen in 1994^a

Placenta shampoo (contains placental extract)
Queen Helene Placenta cream hair conditioner (placental enzymes)
Placenta revitalizing shampoo (contains placental extract)
Perm repair with placenta ^b
Proline perm repair with placenta
Hask Placenta no rinse instant hair repair treatment
Hask Placenta hair conditioner
Mexican Spanish Super Gro Placenta
Nu skin body smoother (human placental extract)
Nu skin NaPCA moisturizer (human placental extract)
Nu skin pH balance (human placental extract)
Nu skin enhancer (human placental extract)
Hormone hair food Jajoba oil
Triple action Super Grow (contains hormones)
Supreme Vita-Gro (contains estrogen and allantoin)
Luster's Sur Glo hormone (contains hormone constituents)
B&B super Gro (contains estrogenic hormone constituents) ^b
Lekair natural Super Glo (contains hormones) ^b
Lekair hormone hair treatment with vitamin E
Isoplus hormone hair treatment with Quinine (contains hormone constituents) ^b
Fermodyl with Placenta hair conditioner, no rinse
Supreme VITA-GRO with allantoin and estrogen plus TEA-COCO

^a Compiled by C. Tiwary.

^b The presence or absence of a hormone was noted from the list of ingredients written on the label of the product. Quantitative analysis was performed only on some of the above products (marked with a "b"). The hormone analysis was done by Leberco Testing/Inc., Roselle Park, NJ applying HPLC for estradiol and estrone and UV spectroscopy for estriol measurement using standard FDA approved methods. Reference: USP XXII, The United States Pharmacopeia, 22nd Revision. United States Pharmacopeia Convention Inc., 1990: p. 530 (estrone and estradiol), p. 534 (estriol).

pattern are unclear but cannot solely be attributed to differences in body mass index [27–31].

It is significant to note that the American Academy of Pediatrics lists 16 priority environmental hazards that should be reduced or controlled to protect children [32]. Although associated with early sexual development, PCPs are not on the list [21,22,33] suggesting that this exposure and its health consequences requires further investigation.

Hypothesis

It is well established that a woman's lifetime risk of breast cancer increases with greater duration and

cumulative levels of exposure to estrogens, whether endogenous or exogenous. Estradiol and synthetic estrogens are established carcinogens [14,34], which can be found in a number of commercially available PCPs (Table 1). We hypothesize that *in utero* and early life exposures to exogenous estrogens, including those added to PCPs and those derived from the widespread estrogenic environmental contaminant bisphenol A (BPA) [35] that can be found in foods, make an overlooked and underestimated contribution both to premature sexual development and to breast cancer risk. Agents that stimulate breast bud development in early life may prime estrogen receptors in breast cells to undergo altered proliferative responses during young adulthood. These *in utero*, early life and ongoing lifetime exposures to estrogens and xenoestrogens and xenohormones could account in part for the higher incidence of breast cancer in young African American women. Continued exposure to xenohormones in PCPs throughout life may also contribute to the increased lethality of breast cancer in both younger and older African American women.

For premenopausal breast cancer, the earlier routine ovulation is established the greater the lifetime risk of breast cancer. In general, for each year that menarche is delayed, breast cancer risk declines between 10% and 20% [1]. Younger age at menarche translates into earlier estrogen exposure, which may partly explain why African American women develop breast cancer at younger ages than white women. Case-control studies have confirmed that serum estrogen levels are higher in breast cancer cases when compared to controls [23].

This hypothesis provides one explanation for the higher rates in young African Americans of premature appearance of secondary sexual characteristics and pre-menopausal breast cancer: Xenoestrogenic environmental factors, including those contained in PCPs such as cosmetics, shampoos, and styling aids, that appear to be more commonly used by the African American population, as well as dietary factors that can include hormones or hormone-mimicking compounds, may account in part for these patterns. This hypothesis provides one explanation for the higher rates of premature appearance of secondary sexual characteristics in young African American girls and the excess incidence of premenopausal breast cancer in young African American women. Persisting exposures to xenohormones in PCPs throughout life may also account for the increased lethality of breast cancer for post-menopausal African American women.

Supporting information

A literature review identified 10 reports describing cases of premature sexual development in children exposed to hormone containing products (Table 2). The development of premature sexual characteristics in four African American girls aged 14 months to almost 8 years is one example that shows the variation in age at which premature sexual development was observed following topical application of PCPs containing hormones for as little as 2 months after the use of a hair product containing placenta or 6 months after the use of a hair product containing estrogens. Serum hormone levels were elevated in these children (see Table 3) [22].

Most hair care products contain petrolatum, lanolin, vegetable, mineral or animal oils. Some of these compounds may cause acne or papular eruptions on the temple or forehead [36], but are not reported to cause premature development of breasts and/or pubic hair. Hormone and/or placenta are ingredients in certain hair products that have been associated with premature sexual development. Hormone analysis of several of these hair care products identified estrogens and measured estriol concentrations between 16 and 20 mg/g and concentrations of estradiol at 0.04 mg/g [22].

Studies do not exist to specify the minimum amount of estrogen that will result in early sexual development. Direct comparison of estrogen concentration in the published studies cannot be made because of the differences in the type, potency, absorption characteristics and duration of action of the estrogens contained in these PCPs. For example, the amount of estrogen absorbed from a hair care product depends on multiple variables such as: the temperature of application; the quantity of the product applied; the place and area of application; the duration and frequency of application; variation in estrogenic potency and the concentration of the particular estrogen in the hair product; the age and health of the child; the presence of any disease of the hair or skin; and individual variations in estrogen metabolism. The concentration of a hormone in a PCP that was considered safe in 1962 [37], was shown to cause health effects in 1985 [33]. Thus, the use of PCPs containing even very low amounts of estrogen during critical windows of development during childhood is problematic.

Further complicating investigation of this hypothesis is the fact that the effects of prenatal or early-life estrogen exposure may be delayed and subsequently appear many years after the estrogen exposure has been eliminated. Prenatal use of the synthetic hormone, diethylstilbestrol

Table 2 Published studies of hormone-containing products and sexual development in children and adults

Author(s)	Year	Journal	Case/study participants	Exposure	Results	Conclusions
Kunz GJ Klein KO Clemons RD Gottschalk ME Jones KL	2004	Pediatrics	Children	Passive transfer of steroids from parents to children	<ul style="list-style-type: none"> –Children were virilized by contact with adults using cutaneous steroid preparations –Laboratory data were consistent with (endo) exogenous androgen exposure 	Discontinuation of contact resulted in a decrease of androgen levels or regression of symptoms
Franklin SL Geffner ME	2003	J Pediatr Endocrinol Metab	2.67 year-old boy	Presumed inadvertent long-term exposure to a testosterone cream used by father	<ul style="list-style-type: none"> –Pronounced virilization –Marked penile and pubic hair growth –Accelerated height velocity and skeletal maturation –Increased muscle mass 	
Li ST Lozano P Grossman DC Graham E	2002	Arch Pediatr Adolesc Med	Children	Prevalence of HCHP use	<ul style="list-style-type: none"> –HCHP use was reported by 21% (27/130) of respondents –HCHP use was more prevalent in African American parents (45%) than parents of all other races/ethnicities –African immigrant parents only reported a 12% use –85% of parents who used HCHPs also used these products on their children, even children younger than 5 years –65% of families only used HCHPs on their children occasionally but 33% of families used them regularly 	<ul style="list-style-type: none"> –It is possible that use of HCHPs may contribute to the earlier onset of puberty in this population –In order to ascertain whether an association exists between HCHPs and precocious puberty, more research is needed

Colon I Caro D Bourdony CJ Rosario O	2000	Environ Health Perspect	<ul style="list-style-type: none"> –Serum samples of Puerto Rican girls with premature thelarche (<i>n</i> = 41) –Control samples (<i>n</i> = 35) 	Pollutants in the serum of Puerto Rican girls with premature thelarche	<ul style="list-style-type: none"> –No pesticides or pesticide metabolite residues were found in the serum of either cases or controls –“Significantly high levels of phthalates” [dimethyl, diethyl, dibutyl, and di-(2-ethylhexyl) phthalates and its major metabolite mono-(2-ethylhexyl) phthalate were identified in 28 (68%) samples from thelarche patients –Of the control samples analyzed, only one showed significant levels of di-isooctyl phthalate –The phthalates that we identified have been classified as endocrine disruptors 	There is a “possible association between plasticizers with known estrogenic and anti-androgenic activity and the cause of premature breast development in a human female population
Yu YMN Elder D D’Ercole AJ	1999	Pediatrics	2-year old boy	<ul style="list-style-type: none"> –Incidental and unintentional dermal exposure, over 2 months, to a testosterone cream that was applied to the boy’s father’s arm and back (as a part of body building regimen) 	<ul style="list-style-type: none"> –Virilization, including penile enlargement and growth of pubic hair and facial acne 	Once exposure was stopped, signs of virilization diminished within several months except for penile size
Tiwary CM	1998	Clin Pediatr	4 African American girls ages 14–93 months.	Estrogen or placenta-containing hair care products	Development of breast or pubic hair 2–24 months after beginning use	<ul style="list-style-type: none"> –Discontinuing the use showed a regression of breast or pubic hair –Serum gonadotropins and estradiol levels were variable –No other causes for early sexual development were noted <p style="text-align: right;"><i>(continued on next page)</i></p>

Table 2 (continued)

Author(s)	Year	Journal	Case/study participants	Exposure	Results	Conclusions
Tiwary CM	1997	Mil Med	Survey of HCHP usage frequency among different racial groups attending the pediatric clinics of military medical treatment facilities ($n = 521$)	4 of the analyzed products showed presence of estriol and/or estradiol	<ul style="list-style-type: none"> –64% of African Americans and 6.9% of Caucasians used products containing hormone/placenta ($p < 0.0001$) –Of the parents who used such products, 5.5% used them on their children –An additional 5.5% of children (from a restricted sample) went to a barber therefore exposure is unknown 	It is speculated that the use of hair products containing hormone/placenta on children may affect their sexual maturation
Zimmerman PA Francis GL Poth M	1995	Mil Med	Reviewed the records of consecutive children referred for evaluation of sexual precocity ($n = 102$)	Usage frequency and biological effects of HCHPs	<ul style="list-style-type: none"> –8 children (7.8%) were using these products –All 8 were black (100%), compared to 57 (61%) of the 94 patients not using such products ($p < 0.05$) 	Hormone exposure via hair care products may be more frequent than expected and should be considered in the differential diagnosis of early sexual development in children
Gottswinter JM Korth-Schutz S Ziegler R	1984	J Endocrinol Invest	Two men aged 48 and 54. They are not children. Need to change the title of the table	Estrogen-containing hair lotions	<ul style="list-style-type: none"> –The men developed gynecomastia and lost their potency after hair lotion use –During exposure to the lotion the levels of 17-beta estradiol were increased, whereas the levels of testosterone and gonadotropins were depressed 	Application of estrogen-containing hair lotions should be considered in the differential diagnosis of gynecomastia
Eddin DV Levitsky LL	1982	Am J Dis Child	Gynecomastia associated with plasma estrogen levels was observed in a pre-pubertal boy	Hair cream containing substantial amounts of estrogen	After use of the hair cream was discontinued, breast tissue regressed and estrogen levels returned to normal.	Until this study, scalp inunctions had not been reported as linked to prepubertal gynecomastia

HCHP = hormone containing hair-care products.

Table 3 Basal and LHRH-stimulated serum hormonal values among four african american girls with premature development of breasts or pubic hair^a

Patient number	Basal values		Peak values			Basal estradiol (pmol/L)
	LH (IU/L)	FSH (IU/L)	LH (IU/L)	FSH (IU/L)	LH/FSH ratio	
2	<0.2	3.1	ND	ND	ND	Normal ^b
3	<0.5	2.5	3.2	28	0.114	20.19
4	<0.5	2.9	2.6	30.9	0.086	<18.36
Control	<0.1–0.8	1.7–2.2	ND	ND	^c Range 0.75–1.83	<18.36
					^d Range 0.18–0.41	

^{*}Serum estradiol (pmol/L) after LHRH injection was 23.13 pmol/L. The value is in the range found in pubertal children.

LH = luteinizing hormone; FSH = follicle stimulating hormone; LHRH = luteinizing hormone-releasing hormone; ND = not done.

^a Taken from Ref. [22].

^b Normal basal serum estradiol value in pre-pubertal children is at or below the lower limit of the sensitivity of the assay.

^c Range of the peak serum LH/FSH ratio in children with precocious puberty.

^d Range of the peak serum LH/FSH ratio in children with premature adrenarche.

(DES) produced a range of reproductive abnormalities in children that were not evident until early adolescence. Female children were at risk of developing vaginal adenomatosis during adolescence or early adulthood and were at increased risk for developing a rare adenocarcinoma of the vagina. As a result, DES has been the first recognized transplacental carcinogen in humans [38]; males exposed prenatally to DES were at risk of impaired fertility [39]. Follow up of adolescent girls treated with DES and/or ethinyl estradiol, has shown reduced fertility in later life [40]. Their mothers have a moderate increase in breast cancer risk from the use of DES during pregnancy; a risk that their daughters appear to share [41–43].

Discussion

The Gail Model and variations of it are commonly used to assess an individual woman's risk of developing breast cancer [44–46]. It is based on observed characteristics of women with breast cancer in a population that consisted chiefly of white women over the age of 40 [45–48]. This widely used model does not predict breast cancer risk in young women generally and should not be used for that purpose [45,49–52]. It also underestimates genetically inherited breast cancer because it does not take into account paternal history. Other limitations of the Gail model are that it neglects family history information in second-degree relatives, it treats pre- and postmenopausal breast cancer as if they are the same disease, and it ignores personal histories of lobular neoplasia [53].

Early sexual maturation and/or pubic hair is more common among African American females than white females [26,27]. Hormones and/or placenta are ingredients in certain hair products that

have been associated with premature sexual development in African American girls. The reasons for this phenomenon are unknown. Body Mass Index (BMI) appears to make a less significant contribution to early pubertal development in African American girls compared with whites [28]. Genetic and/or environmental factors specific to the African American population might be important contributors to the early onset of puberty [28]. Studies in Ghana, South Africa and Nigeria report that on average, girls reach menarche at between 14 and 14.7 years of age, respectively [54–57]. Therefore, genetic factors are unlikely to be solely responsible because, as mentioned above, African blacks do not share the characteristic of premature sexual maturation with African Americans.

Studies do not exist to specify the minimum amount of estrogens that will result in early sexual development. Doses of the estrogens that were involved in the published case studies of premature sexual development cannot be determined because of the differences in the type, potency, absorption characteristics and duration of action of the estrogens among a wide range of PCPs.

Some studies have found that African American adults and children use PCP-containing hormones about 6–10 times more frequently than do whites [58–60]. Even so, these reports probably underestimate the frequency of use of the hormone or placenta containing hair products for a number of reasons that include: (1) the surveys used to capture product use did not include all the hair products that contain hormone or placenta; (2) some hair products may contain hormones but not list it as an ingredient preventing the user from being made aware of their exposure to the hormone or placenta containing hair product; or (3) hair products intended to be used by professionals (barbers and hair dressers) may not list the ingredients at

all, therefore, a person visiting a barber will not know if he/she is exposed to a hormone or placenta containing hair product [58–60]. The continuous use of PCPs from a young age combined with earlier estrogen exposure as a result of early age at menarche may increase cumulative estrogen exposure and thereby stimulate the development of breast cancer in African American women.

The National Institutes of Environmental Health Sciences (NIEHS) Center grants on breast cancer and the environment are being used by researchers at several institutions to support epidemiologic studies to evaluate the role of early estrogen exposure from a variety of sources including PCPs, in African American and white women. Other work being conducted as part of the Sister Study intramurally at NIEHS will evaluate the use of PCPs in 50,000 women. It will also examine the racial distribution of breast cancer patients who use such products, and will include specific questions on the use of hair products containing hormone or placenta, duration of use, estrogen content in the products and type of estrogen (estrone, estradiol, and estriol). In the case of placenta-containing products, where possible, this work will provide additional analysis for human chorionic gonadotropin, luteinizing hormone, and follicle stimulating hormone [61].

To test this hypothesis it will be important for researchers to ascertain past use and exposure to these products in women being studied. As mentioned previously, definite regression or non-progression of premature sexual characteristics has been reported in several children after the use of hair product containing hormone or placenta has been discontinued. The resolution of the breast may take months or years, however, in some cases the resolution may not occur at all [15,62]. The reason for the non-resolution is uncertain, but may be related to onset of early puberty or activation of the hypothalamic pituitary system after prolonged exposure to the estrogens [63]. If it is determined that exposure to estrogenic compounds contained in PCPs is a risk factor that affects morbidity, mortality or initiation of breast cancer, it may be possible to modify the natural history of breast cancer in exposed population by eliminating estrogenic ingredients from PCPs.

Conclusions

The absence of public information on past exposures to hormones and hormone-mimicking compounds in PCPs hampers the ability to conduct

research on this topic. In the Cosmetic Handbook published in 1992 the FDA describes proposed legislation to regulate estrogen concentration in over-the-counter products both as a drug and through misbranding. Estrogen concentration would be limited to less than 10,000 IU per ounce and total exposure for an individual is limited to 20,000 IU per month with no detail regarding size, age or sex of consumers who might be exposed [64]. In 1992 the “panel’s recommendation [had] not yet been accepted by the FDA as a basis for regulatory decisions.” In 1994, the FDA began to officially regulate products listing hormones as ingredients under their authority to regulate new drugs. “Any ‘over-the-counter’ drug or a product that is labeled, represented, or promoted as a topically applied hormone-containing product ... is regarded as a new drug ... for which an approved application ... is required for marketing.” Since 1994 any PCP labeled to indicate that it is a “hormone cream” or that it “contains hormones” is considered a drug by the FDA and falls under their regulatory authority [65].

It is important to note, however, that the biological activity of estrogen varies depending on the type of estrogen used as an ingredient. Of the naturally occurring estrogens, estradiol is most active, estrone has one-tenth the biological activity of estradiol, and estriol has the lowest potency [66]. The synthetic estrogen, DES, is more active than all three natural estrogens. Most manufacturers do not list either the amount or the concentration of estrogen on their product labels [67].

In addition, manufacturers are not currently required to disclose ingredients that they consider trade secrets nor are they required to report on past formulations of their products. It is a matter of considerable importance for public health to determining whether or not such estrogenic exposures play a role in the unexplained patterns of breast cancer in young African American women, or contribute to the poorer prognosis for African American women at all ages. Consistent with established theories of breast cancer etiology, early-life exposure to estrogenic agents is expected to increase lifetime risk of the disease, as is continued exposures to hormonally active compounds throughout life.

People have a right to know whether products they use on themselves or their children contain compounds that may increase their risk of disease, including cancer. Under current policy in many countries that right is denied. As a matter of public health policy, manufacturers should be required to provide information on current and past inclusion of hormones in their PCPs. In the meantime, par-

ents and guardians should be advised to avoid using any products on children that are known or suspected to contain hormones and/or placenta. Efforts to promote voluntary release of ingredients in PCPs by manufacturers should be considered a priority so that consumers, who may use these products on themselves and their children, can make better and more informed choices.

Acknowledgement

Heinz Endowments, DSF Charitable Trust, and the University of Pittsburgh Cancer Institute provided funding.

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