Abstracts of research on breast cancer, Alzheimer’s disease and aluminum in antiperspirants.
Aluminium salts are the major constituent of many widely used antiperspirant products. The use of such antiperspirants has been linked with the systemic accumulation of aluminium and an increased risk of Alzheimer’s disease. But can the frequent use of aluminium-based antiperspirants lead to the accumulation of toxic levels of aluminium? And are there measures that we can take to reduce such accumulation without reducing the effectiveness of antiperspirants?

If exposure to aluminium in antiperspirants presents health risks, its content should be reduced

Since aluminium (Al) pervades our environment, the scientific community has for many years raised concerns regarding its safety in humans. Al is present in numerous cosmetics such as antiperspirants, lipsticks and sunscreens. Al chlorohydrate is the active antiperspirant agent in underarm cosmetics and may constitute for Al a key exposure route to the human body and a potential source of damage. An in vitro study has demonstrated that Al from antiperspirant can be absorbed through viable human stripped skin. The potential toxicity of Al has been clearly shown and recent works convincingly argue that Al could be involved in cancerogenic processes. Nowadays, for example, Al is suspected of being involved in breast cancer. Recent work in cells in culture has lent credence to the hypothesis that this metal could accumulate in the mammary gland and selectively interfere with the biological properties of breast epithelial cells, thereby promoting a cascade of alterations reminiscent of the early phases of malignant transformation. In addition, several studies suggest that the presence of Al in human breast could influence metastatic process. As a consequence, given that the toxicity of Al has been widely recognized and that it is not a physiological component in human tissues, reducing the concentration of this metal in antiperspirants is a matter of urgency.
Aluminum salts such as aluminum chlorohydrate (ACH) are known for use as an active antiperspirant agent that blocks the secretion of sweat. A local case report of hyperaluminemia in a woman using an aluminum-containing antiperspirant for 4 years raises the problem of transdermal absorption of aluminum (Al). Only a very limited number of studies have shown that the skin is an effective barrier to transdermal uptake of Al. In accordance with our analytical procedure, the aim of this study with an in vitro Franz™ diffusion cell was to measure aluminum uptake from three cosmetic formulations of antiperspirant: the base for an “aerosol” (38.5% of ACH), a “roll-on” emulsion (14.5% ACH), and a “stick” (21.2%), by samples of intact and stripped human skin (5 donors). The Al assays were performed by Zeeman Electrothermal Atomic Absorption Spectrophotometry (ZEAAS). Following contacts lasting 6, 12 and 24 h, the Al assays showed only insignificant transdermal absorption of Al (≤ 0.07% of the quantity of Al deposited) and particularly low cutaneous quantities that varied according to the formulations (1.8 μg/cm² for “aerosol base” and “stick” — 0.5 μg/cm² for the “roll-on”). On stripped skin, for which only the “stick” formulation was tested, the measured uptake was significantly higher (11.50 μg/cm² versus 1.81 μg/cm² for normal skin). These results offer reassurance as regards to the use of antiperspirants for topical application of ACH-containing cosmetic formulations on healthy skin over a limited time span (24 h). On the other hand, high transdermal Al uptake on stripped skin should compel antiperspirant manufacturers to proceed with the utmost caution.

Aluminium, antiperspirants and breast cancer

Aluminium salts are used as the active antiperspirant agent in underarm cosmetics, but the effects of widespread, long term and increasing use remain unknown, especially in relation to the breast, which is a local area of application. Clinical studies showing a disproportionately high incidence of breast cancer in the upper outer quadrant of the breast together with reports of genomic instability in outer quadrants of the breast provide supporting evidence for a role for locally applied cosmetic chemicals in the development of breast cancer. Aluminium is known to have a genotoxic profile, capable of causing both DNA alterations and epigenetic effects, and this would be consistent with a potential role in breast cancer if such effects occurred in breast cells. Oestrogen is a well established influence in breast cancer and its action,
dependent on intracellular receptors which function as ligand-activated zinc finger transcription factors, suggests one possible point of interference from aluminium. Results reported here demonstrate that aluminium in the form of aluminium chloride or aluminium chlorhydrate can interfere with the function of oestrogen receptors of MCF7 human breast cancer cells both in terms of ligand binding and in terms of oestrogen-regulated reporter gene expression. This adds aluminium to the increasing list of metals capable of interfering with oestrogen action and termed metalloestrogens. Further studies are now needed to identify the molecular basis of this action, the longer term effects of aluminium exposure and whether aluminium can cause aberrations to other signalling pathways in breast cells. Given the wide exposure of the human population to antiperspirants, it will be important to establish dermal absorption in the local area of the breast and whether long term low level absorption could play a role in the increasing incidence of breast cancer.