Analysis and Risk Assessment of Volatile Organic Compounds in Disposable Sanitary Pads

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Introduction

The monthly cycle of women of reproductive age requires the use of sanitary measures and such as disposable sanitary pads (DSPs)[1]. For all types of DSPs, the top sheet is commonly a thin layered fluid-permeable non-woven perforated polypropylene and/or polyethylene (in direct contact with the skin of the vulva and vagina), an optional acquisition layer, an absorbent core beneath the acquisition layer which functions as fluid storage. This layer is composed of a blend of super absorbent polymer (SAP) granules and fluff cellulose, which are encapsulated by cellulose or non-woven polypropylene[2,3,4,5]. The absorbent core of the DSPs can also be composed of synthetic plastic material[3]. Lastly, is the back sheet which supports adhesive[6].

Manufacturers of DSPs are not obligated to provide a detailed list of ingredients contained in DSPs based on the act or regulatory classification of the country they are produced in.

Aim

The aim of this study is to identify, quantify and perform a risk assessment of VOCs in DSPs.

Methodology

Commonly used DSPs will be collected by random sampling and analysed in duplicates using static headspace gas chromatography-mass spectrometry.

Discussion

DSPs are only one class of feminine hygiene products used by females which has the potential to affect their reproductive system. This is counterproductive considering the fact that DSPs are to be used on average once a month from menarche all through to menopause.

Some volatile organic compounds in the superabsorbent layer of disposable sanitary pads contribute negatively the reproductive health of the users.

Examples of carcinogenic VOCs detected in DSPs are styrene, chloromethane, chloroethane, chloroform, acetone[4]. bromodichloromethane, carbon tetrachloride, cumene, 1,2-dichloroethane, 1,2-dichloropropane, 1,4-dichlorobenzene, 4-methy 1-2-pentanone, naphthalene, bromoform, 1,2-dibromo-3-chloropropane, 1,2-dibromoethane, 1,1-dichloroethylene, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, and 1,2,3-trichloropropane[8].

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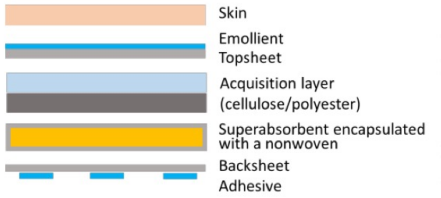

Figure 1. Layer construction of DSPs[7].

Parameters to be used to determine estimated dermal exposure to VOCs[3,7]:

- Mass of the SAP layer (g).
- Concentration of each VOC in SAP layer (mg/pad).
- Number of DSPs used per day.
- Number of days DSP was used.
- Absorption rate (%).
- Body weight of the user (kg).

Parameters to be used to determine health effects (non-cancer):

- Estimated dermal exposure.
- Margin of exposure values from Agency for Toxic Substances and Disease Registry and World Health Organisation.

Parameters to be used to determine health effects (cancer):

- Uncertainty Factor.
- Slope Factor.

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