

Skin Absorption of Phenoxyethanol from Baby Wipe Products

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OBJECTIVE: In the infant population, there is regular use of diapers and cleansing wipes. The skin covered by a diaper is clearly an occluded environment and this may result in over-hydration of skin. Considering that the practice of wiping the diaper area is carried out regularly, there is repeated exposure of the skin to ingredients contained in baby wipes. To date there has been no published information regarding dermal absorption of ingredients contained in these products. Several baby wipe formulations contain 2-phenoxyethanol (PE) as a preservative and cetylpyridinium chloride (CPC) as a surfactant with antimicrobial activity. However, information regarding skin absorption of PE in the presence of CPC in the scientific literature is limited. The objectives of the present study were (1) to determine the concentrations of PE and CPC contained in the lotion extracted from baby wipe products and (2) to investigate the *in vitro* permeation profiles of PE from the lotion formulations in human skin. **METHODS:** Three commercial baby wipe products containing PE and CPC were obtained, namely Cussons Baby Wipes Pure & Gentle (Cussons), Paseo Baby Wipes (Paseo), and Pigeon Baby Wipes (Pigeon). The amounts of lotion contained in the baby wipes were determined gravimetrically. Subsequently, PE amounts in the baby wipes were determined by extracting the wipes with methanol under constant stirring for 24 h, followed by sonication for 15 min. The wipe fabric material was then dried for 72 h at room temperature and weighed. The lotion contained in the baby wipes was extracted for further studies by using manual pressure for 1 min and the amounts of PE in the lotion were determined by using HPLC. *In vitro* permeation studies were conducted for all the PE-containing lotion formulations in human skin for 24 h under finite dose conditions. **RESULTS:** The amounts of lotion contained in the Cussons, Paseo, and Pigeon products were determined as 1.96 ± 0.03 , 3.10 ± 0.06 , and 2.61 ± 0.15 g per g of dry fabric, respectively. The amounts of PE contained in the lotion for the Cussons, Paseo, and Pigeon products were determined as 1.49 ± 0.01 , 0.67 ± 0.01 , and 2.85 ± 0.03 mg/mL, respectively. The cumulative amounts of PE which permeated at 24 h for the Cussons, Paseo, and Pigeon products were 12.25 ± 0.44 , 6.15 ± 0.13 , and 23.97 ± 1.02 μ g, respectively. **CONCLUSION:** This is the first study to report the amounts of PE that permeate *in vitro* in human skin from the lotion contained in commercial baby wipes. The findings indicate that more than 80% of PE permeated from the applied dose of lotion. It is important to note that the *in vitro* model employed in this work does not reflect actual in-use conditions for these products. Future studies will focus on development of models that better replicate the short contact time of these formulations with the skin.

Keywords

diaper area; human skin; infants; permeation; preservative; skin care