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Electric field analysis on the improved skin concentration of benzoate by electroporation

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The object in the present study was to understand the relationship between the increased skin concentration of benzoate after topical application of its sodium salt and the electric field intensity produced in the stratum corneum by electroporation. An excised hairless rat skin was set in a diffusion cell, and 0.5% sodium benzoate and saline were applied to the stratum corneum and dermis sides, respectively. Two needle electrodes were placed on the skin surface and an electrical pulse was applied to the rat skin at 300 V every minute for 10 min. The amounts of benzoate in different positions of the skin were measured. Field intensity generated in the stratum corneum was determined by a finite element method. The amounts of benzoate at different sites in the skin were almost proportional to the mean field intensity in the corresponding stratum corneum.