

## Lateral Diffusion of drugs inside skin as determined by Microdialysis

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**Purpose:** To determine the lateral diffusion of Acyclovir (ACV) and Methotrexate (MTX) during iontophoresis using in vitro microdialysis.

**Methods:** The studies were done on Franz cells using freshly excised hairless rat skin. Two linear probes were inserted into the skin such that one probe (P1) was placed under the skin area exposed to the donor solution, while the other (P2) was placed 1 cm away, under the top cover not exposed to the donor. Cathodal iontophoresis (Ag/AgCl electrode; 0.3 mA/sqcm; 4 hrs) was applied with either ACV (43 mg/ml) or MTX (15 mg/ml) in the donor. Samples were collected over 8 hrs from the two probes, perfused with receptor buffer at 2 ul/min. After the study, skin exposed to donor was punch biopsed and 10 tape strips were taken by Transpore tape<sup>TM</sup> (3M). Each tape was weighed before and after the tape stripping (TS) and UV absorbance was measured at 430 nm to estimate the pseudoabsorption of corneocytes. The weight differences from TS were compared with the absorption from UV to estimate the amount of stratum corneum (SC) removed.

**Results:** MTX showed no evidence of lateral diffusion over 8 hrs. The average concentration in P1 was  $9.24 \pm 2.78$  ug /sq cm and the cumulative amount permeated over this time was  $52.06 \pm 1.36$  ug /sq cm. In contrast, ACV showed some lateral diffusion beginning at 0.5 hr at  $0.1 \pm 0.2$  ug/ml in P2, but then decreasing quickly to  $0.01 \pm 0.03$  ug/ml at 1 hr with no change over the next 8 hrs. The average concentration in P1 was  $16.11 \pm 1.7$  ug / ml and the cumulative amount in the receptor was  $242.08 \pm 25.25$  ug/sq cm. The difference in weight of tape strips and UV absorption decreased with successive tape strips.

**Conclusion:** MTX did not show any lateral diffusion inside the skin. ACV had some lateral diffusion which can possibly be due to depot formation in the skin. TS and the UV absorption are sensitive in detecting the SC removed for these drugs.

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