The Ion-Exchange Mechanism Revisited

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Hair as a biological matrix presents a longer window of detection when compared to other biological matrices such as blood or urine. In order to understand the mechanism of drug incorporation, models have been developed and are under study. In a previous study, dimethyldiazodianiline (DMADA) was incorporated into various hair types and shown to be a suitable surrogate for in vitro radiotracer studies. In this study, it is hypothesized that DMADA may also prove to be a suitable surrogate for assessing hair permeability through the exposure of virgin hair to active ingredients in common hair care preparations at a concentration of 100 mM (sodium hydroxide, urea, hydrochloric acid, acetic acid, guanidine hydrochloride, and sodium carbonate, respectively) for 2 hours followed by neutralization and DMADA incorporation. DMADA incorporation into hair was determined using Beer's Law, measuring dye incorporation at lambda max (510 nm) for all hair treatments and compared to untreated hair as the control. DMADA incorporation was shown to be a function of base strength and was therefore aligned with the ion-exchange mechanism previously proposed by Kidwell and Blank. DMADA was also shown to be a suitable surrogate for hair permeability studies. Future studies will focus on micro-spectroscopic analysis of hair fibers using IR, Raman and Atomic Force Microscopy (AFM). These imaging techniques allow one to follow changes in specific functional group as a function of chemical treatment.

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