

# Analysis of Anti-Inflammatory Compounds in Drug Absorption and Calculated Transdermal Permeability Utilizing the Parallel Artificial Membrane Permeability Assay (PAMPA)

Bartrum, Olivia (School: Wakefield High School)

Determining transdermal permeability of compounds facilitates an understanding of drug distribution, improving quality of medical care. The study's purpose was to analyze transdermal drug absorption of anti-inflammatory compounds at varying concentrations. The parallel artificial membrane permeability assay provided an in-vitro model for simulating passive transdermal absorption via a dodecane and polyvinylidene fluoride membrane. Due to its smaller particle size, capsaicin was hypothesized to be more permeable relative to hydrocortisone and menthol. It was also hypothesized that a direct relationship between drug concentration and permeability would exist. Serial dilutions were undergone for each compound to create the desired concentrations (1mM, 0.1mM, 0.01mM, 1 $\mu$ M). Each compound and its associated concentration was transferred to the assay's donor plate (n=3). Blank controls were added separately to account for the presence of DMSO and PBS. Following incubation, UV-Vis spectrophotometry analysis was performed. Capsaicin had the highest UV absorbance at all concentrations. Two-factor ANOVA testing with replication revealed a statistically significant difference in UV absorbance between compounds (1mM:  $p=1.40E-17$ , 0.1mM:  $p=2.31E-26$ , 0.01mM:  $p=4.47E-11$ , 1 $\mu$ M:  $p=4.89E-23$ ). UV absorbance values were utilized to calculate permeability rate. At 1mM, hydrocortisone ( $4.84E-5$  cm/s) and menthol ( $8.08E-6$  cm/s) experienced a higher permeability rate than capsaicin ( $6.61E-6$  cm/s), refuting the hypothesis. This relationship was noted at all concentrations, implying a direct relationship between particle size and transdermal permeability. Increased concentrations were generally associated with concurrent increases in permeability rate, supporting the initial hypothesis.

## Awards Won:

Third Award of \$1,000

Westlake University: A summer camp scholarship to Westlake University, covering the roundtrip international airfare, room and board, insurance, program fee, and excursions in Hangzhou, Beijing, and Shanghai

Long Island University: Presidential Scholarships