Thermoplastic polyurethanes (TPU) have been in use for a variety of drug delivery systems, owing to their excellent mechanical properties, 60-600% elongation at break, and tunable swelling properties. Several studies have attempted to achieve a target controlled release rates of drugs in TPU devices remains poorly understood. This study was undertaken to investigate the influence of solute-solvent interactions and shape factors could also provide some of this discrepancy. Isolation of these mechanisms will require further work and careful selection of the systems of study.

**METHODS**

Drug permeability and diffusion of drug through cylindrical films at 37°C. Diffusion coefficients are calculated through lag time and partition methods. If lag time was not evident, one possible explanation for this difference in diffusion coefficients is solute-polymer interaction, though other factors, including solute-solvent interactions and shape factors could also explain some of this discrepancy. Isolation of these mechanisms will require further work and careful selection of the systems of study.

**RESULTS**

Figure 1. Side by side diffusion cell. The donor chamber is filled with concentrated drug solution and the acceptor chamber is filled with buffer. A resistance paper wick maintains the system at 37°C. Both chambers are constantly stirred to minimize boundary affects.

**REFERENCES**


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**ADDITIONAL INFORMATION**

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**Beyond the first line**

The development of controlled release drug delivery systems requires a great deal of trial and error. For further information, contact Professor Patrick Kiser: patrick.kiser@northwestern.edu

**Figure 2.** Partitioning of tenofovir (FTV-PY-PT60DE), IQP-0528, and levonorgestrel (LVG-PY-PT95AE60) measured using side by side diffusion cells. System was held at 37°C during the experiment. Drug concentrations were measured using an Agilent 1200 series HPLC equipped with a DAD. Measurement of the mass flux through a membrane of known thickness allows us to calculate the diffusion coefficient.

**RESULTS**

Figure 3. Concentration of levonorgestrel (LVG-PY-PT95AE60) (left), bupivicaine (bottom left), and DHA (right) in the acceptor compartment over time for Pathway™ PY-PT60DE, PY-PT95AE, and PY-PT95AE60 measured using side by side diffusion cells. System was held at 37°C during the experiment. Drug concentrations were measured using an Agilent 1200 series HPLC attached to a DAD. Measurement of the mass flux through a membrane of known thickness allows us to calculate the diffusion coefficient.

**RESULTS**

Figure 4. Partitioning of tenofovir, IQP-0528, bupivicaine, levonorgestrel, and ibuprofen through three Pathway™ TPU designed model drugs through polymer films in equilibrium. The permeability and diffusion coefficient of the model drugs through polymer films in equilibrium was measured using side by side diffusion cells. Partitioning of drug into each polyurethane film was also measured.

**PART 1**

Drug permeability and diffusion of drug through cylindrical films at 37°C. Diffusion coefficients are calculated through lag time and partition methods. If lag time was not evident, one possible explanation for this difference in diffusion coefficients is solute-polymer interaction, though other factors, including solute-solvent interactions and shape factors could also explain some of this discrepancy. Isolation of these mechanisms will require further work and careful selection of the systems of study.