Sequential Release of Two Drugs from Flexible Drug Delivery Films

C.L. Rabek[1], T.D. Dziubla[2], and D.A. Puleo[1]
[1] Department of Biomedical Engineering
[2] Department of Chemical and Materials Engineering
University of Kentucky, Lexington, KY, USA

Statement of Purpose

Films composed of 70:30 wt% cellulose acetate phthalate (CAP) and Pluronic F-127 have been proven to be an erosion controlled system, making them an attractive degradable polymer for drug delivery. CAP-Pluronic films are typically rigid, however, and unable to conform to varying geometries that may be needed for dental, wound healing, or other applications. In previous work, plasticizers were added to impart flexibility and release from single films was determined. The objective of the present study was to investigate effects of plasticizers on the sequential release of two drugs.

Methods

Films were prepared using solvent evaporation casting. The CAP and Pluronic were combined in a 70:30 weight ratio. Drug and plasticizer (0, 10, or 20 wt%) were added to the mixture. After acetone was added to each test tube to dissolve the components, solutions were vortexed and poured into Teflon dishes. Samples were kept at 10°C overnight during acetone evaporation. Films were laminated using acetone and then punched into cylinders (6 mm). Cylinders were inserted into polystyrene wells to ensure unidirectional erosion and release. Devices were placed individually into glass vials with 4 ml of phosphate-buffered saline (PBS). Samples were incubated at 37°C on an orbital shaker. Every 4 hours, supernatants were collected (n=3) and replaced with fresh PBS. Supernatants were analyzed using high performance liquid chromatography (HPLC) to determine drug release at each time point.

Results and Discussion

The peaks of ketoprofen and pirfenidone release occurred at 4 and 16 hours, respectively, regardless of plasticizer concentration (Figure 1). Overlap of the ketoprofen and pirfenidone peaks was 12 hours long for all three plasticizer concentrations (Figure 1). The area of overlap release of both ketoprofen and pirfenidone was also not affected by the plasticizer concentration (Figure 2). Ketoprofen and pirfenidone were sequentially released from the system as the surface of the films eroded. Plasticizer content did not affect the drug release profiles.

Conclusions

CAP-Pluronic films are capable of sequentially releasing multiple drugs, regardless of plasticizer concentration. This causes them to be an appealing system for flexible drug delivery films.

Acknowledgements

This research was funded by the NIH (DE019645 and AR060964), and CR was supported by NSF IGERT fellowship (DGE-0653710).

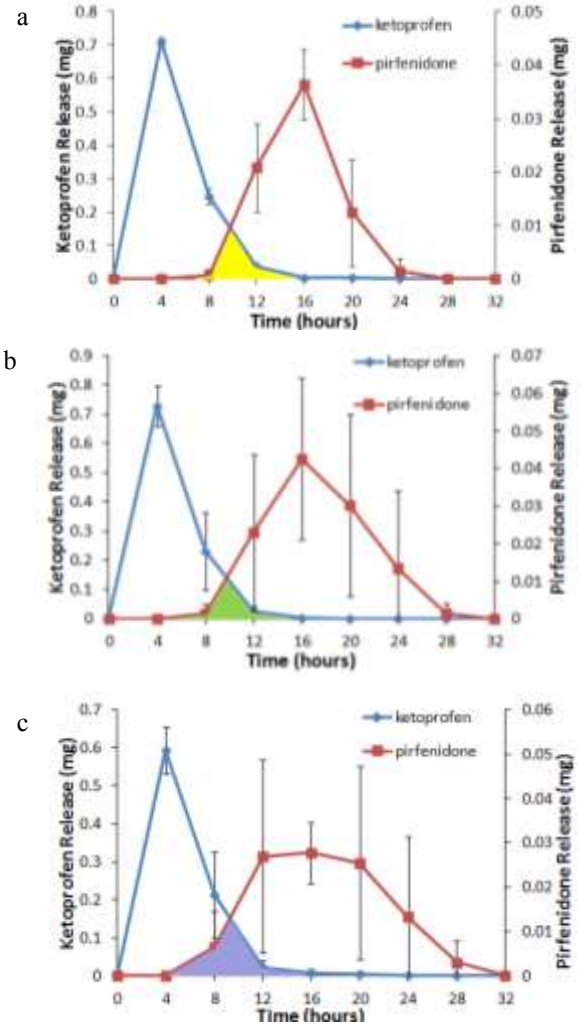

Figure 1. Sequential release of ketoprofen and pirfenidone from (a) 0 wt% TEC, (b) 10 wt% TEC, and (c) 20 wt% TEC plasticized drug delivery films.

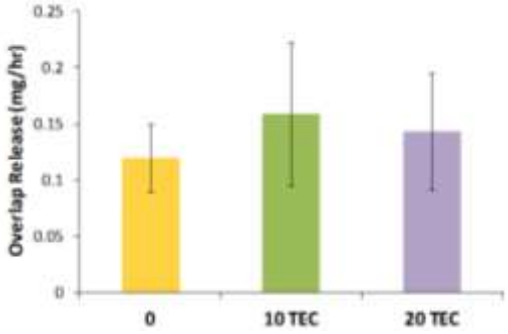

Figure 2. Area under the curve during ketoprofen and pirfenidone overlap release from drug delivery films.