Poly(orthoester) (POE) Based Injectables

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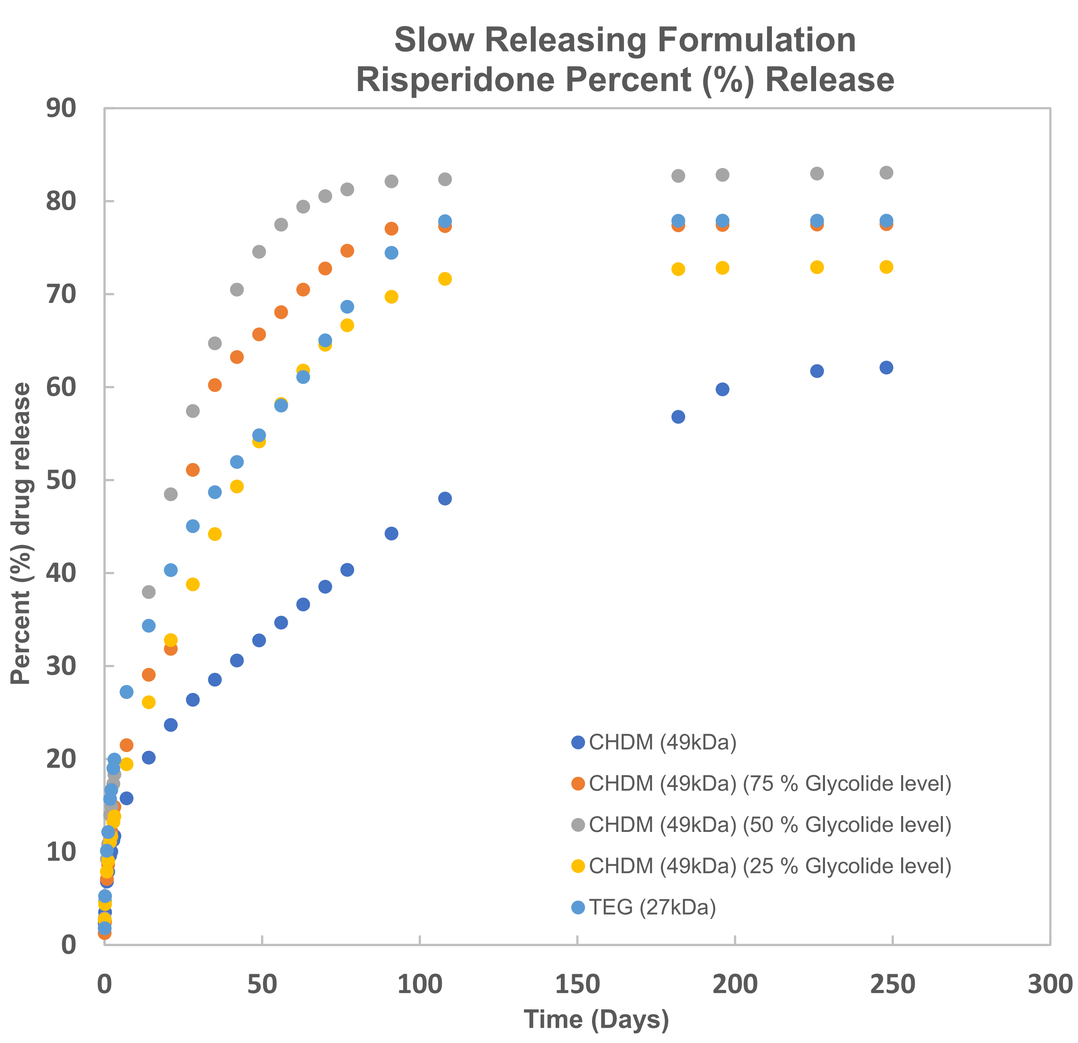
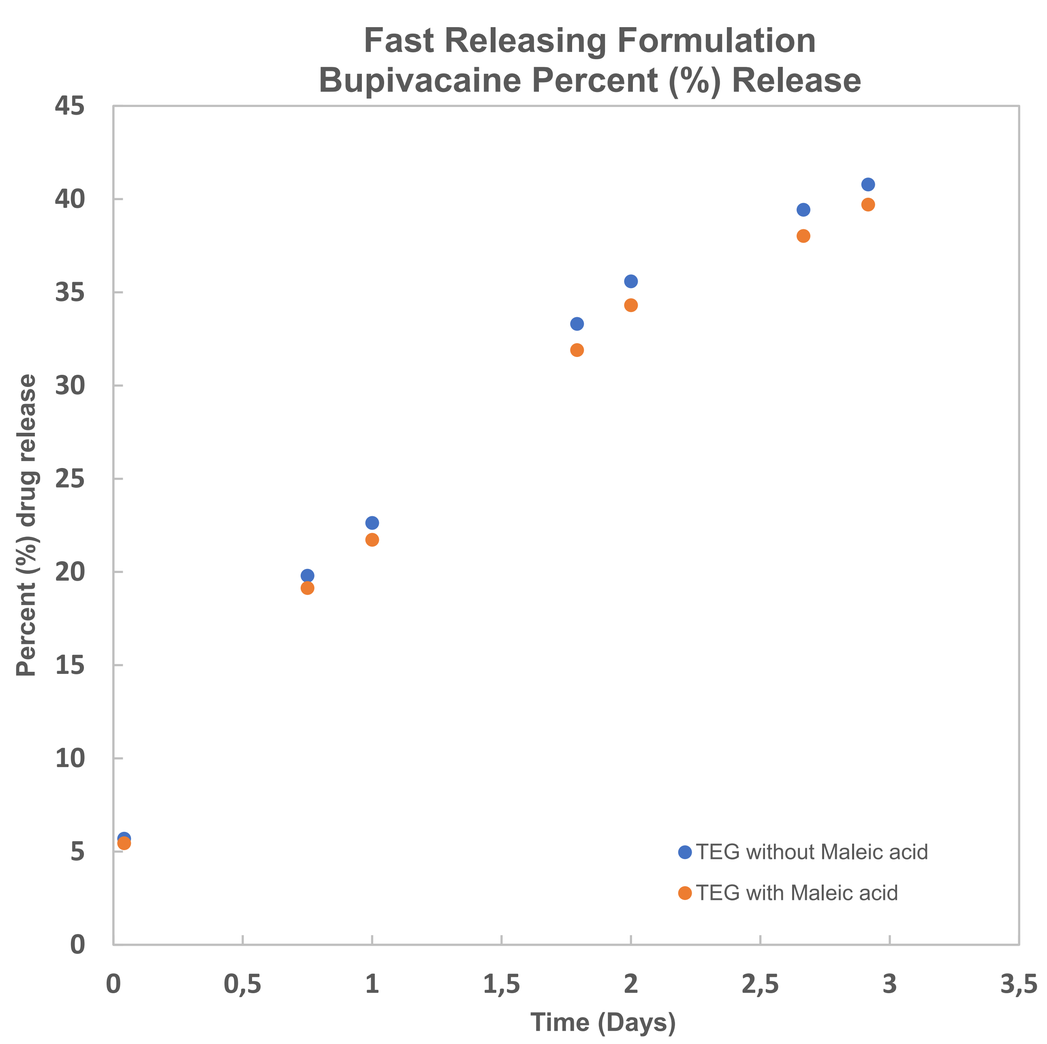
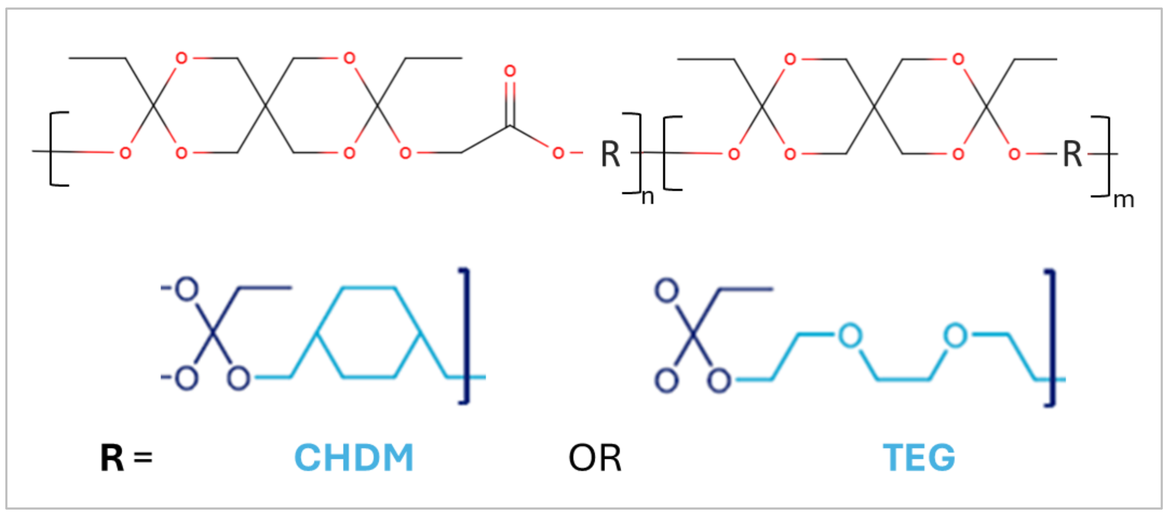
INTRODUCTION

Bioresorbable polymeric drug delivery systems can improve adherence and therapeutic performance in short- and long-acting injectables. Risperidone and bupivacaine were used as model drugs to demonstrate tunable release. Poly(orthoester) (POE), with degradation ranging from days to ~1 year, was evaluated as the delivery matrix. Tunability is achieved by varying glycolide content in CHDM- or TEG-based backbones, where the substituent (CHDM or TEG) controls degradation rate. Fast-releasing 1, 4 Cyclohexanedimethanol (CHDM) and slow-releasing Triethyelene glycol (TEG) with or without varying levels of glycolide content POE formulations were developed to tailor pharmacokinetics, using bupivacaine and risperidone as model drugs, respectively.







ANALYTICAL METHODS

Slow releasing POE Injectable: POE solutions of risperidone were prepared in N-methyl-2-pyrrolidone (NMP) at ~9% w/w drug loading and ~22% w/w polymer. Polymers were weighed into glass vials, dissolved in NMP, and stirred for 2–4 days at ambient temperature to obtain homogeneous solutions. Risperidone was added at the target level and stirred up to 24 h to form dispersions. The dispersion was injected (18G needle) into regenerated cellulose dialysis bags (15 kDa MWCO) containing 1 mL PBS, forming in situ depots (n=3). Bags were placed in 50 mL PBS and stirred at 100 rpm, 37 °C. Samples were collected over time and analyzed by HPLC.
Fast Releasing POE Injectable: POE solutions were prepared in NMP with ~1.3–4% w/w drug and ~40% w/w polymer. Polymers were dissolved as described above. Bupivacaine was added at the target level and stirred up to 24 h to form dispersions. The dispersion was injected into dialysis bags (15 kDa MWCO, 1 mL PBS) to form in situ depots (n=2). Bags were placed in 30 mL of 0.025 M sodium phosphate buffer with 0.03 % SLS and stirred at 100 rpm at 37°C. Samples were collected periodically and analyzed via HPLC.

RESULTS

Slow-releasing POE injectable: Release tunability was achieved across POE chemistries, with ~20–40% risperidone release at 14 days. Burst release was limited to ~15–30%, reducing dose dumping risk. **Fast-releasing POE injectable**: Bupivacaine formulations showed ~30–40% release within 3 days with near-linear kinetics and minimal burst (~5%).

CONCLUSION

These findings demonstrate that POE–based injectable systems provide a versatile platform for precise control of drug release kinetics. By modulating polymer backbone chemistry, release rates can be tailored to meet specific therapeutic durations meeting a range of treatment requirements, supporting the development of customizable long- and short-acting injectable formulations.

PRESENTER BIOGRAPHY

Christian Schneider is a Principal Application and New Business Development Manager focusing on EMEA and Indian markets. He previously led a chemical lab specializing in controlled-release studies for long-acting products. He studied chemistry at the University of Bayreuth, Germany, with a focus on polymer chemistry and colloidal physics, and earned a PhD in physical chemistry at Helmholtz-Zentrum Berlin under Prof. Matthias Ballauff in the field of soft matter and functional materials.

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