

## Modulating drug release from Polyox matrix tablets: influence of Polyox molecular weight, drug solubility and vitamin E

Polyethylene oxide (polyox) has been extensively used as a controlled release excipient to modulate drug release from solid hydrophilic matrix preparations. The attraction of polyox as a polymer matrix is due to its high swelling ability, compressibility and good solubility in water.

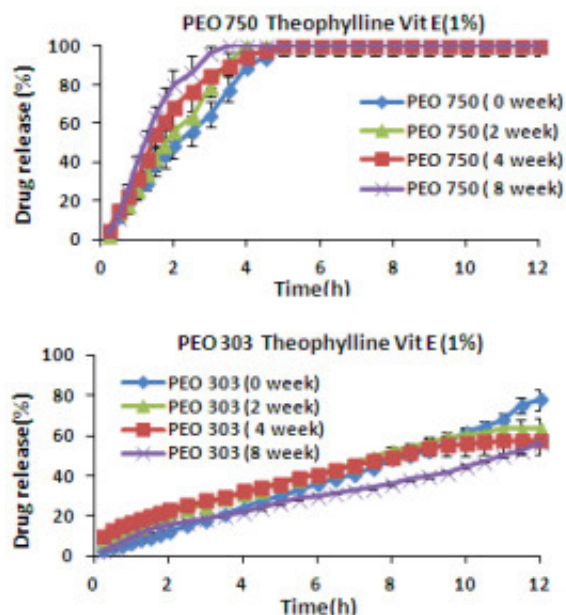


Fig. 1. Release profile of propranolol HCl batches formulated with polyox 750 or 303 at 1:1 drug:polymer ratio, containing 1%w/w vit E and stored at 40°C.

The main objective of the present research was to examine the stability of polyox within tablet formulations containing various soluble drugs. We wanted to investigate if the efficiency of vitamin E as an antioxidant stabilizer for polyox matrices is dependent on the type of model drug formulated. Vitamin E ( $\alpha$ -tocopherol) was selected as an antioxidant because it is a competent stabilizer against oxidation of polyethylene. Three model drugs, namely propranolol HCl (solubility:  $\sim 50$  mg/mL), theophylline ( $\sim 8$  mg/mL) and zonisamide (solubility:  $\sim 0.8$  mg/mL), were selected to cover a range of solubilities. Batches were formulated using a low (polyox 750) and high (polyox 303) MW polyox incorporating vitamin E succinate at 1% w/w, and these were placed under the same storage conditions (40 °C) and tested at 0, 2, 4 and 8 weeks.

The results showed that the presence of vitamin E promoted a stable release rate of a highly

soluble drug propranolol HCl from aged polyox matrix tablets, which was similar to fresh sample, regardless of the molecular weight (MW) of polyox (Fig. 1.). However, the influence of the presence of vitamin E on the release rate of a partially soluble drug, theophylline, was dependent on the MW of polyox. A fast and unstable drug release was obtained in the case of the low MW polyox 750 whereas a stable drug release was obtained in the case of the high MW polyox 303 (Fig. 2a.). The release rate of a low soluble drug, zonisamide, was stable regardless of both the presence of vitamin E and the MW of polyox. The presence of vitamin E slightly slowed the release of zonisamide from aged polyox 303 matrices, but not polyox 750 matrices (Fig. 2b.). Therefore, in order to achieve a suitable controlled release profile from polyox matrices, not only the presence of vitamin E but also the solubility of drug and the MW of polyox should be considered.

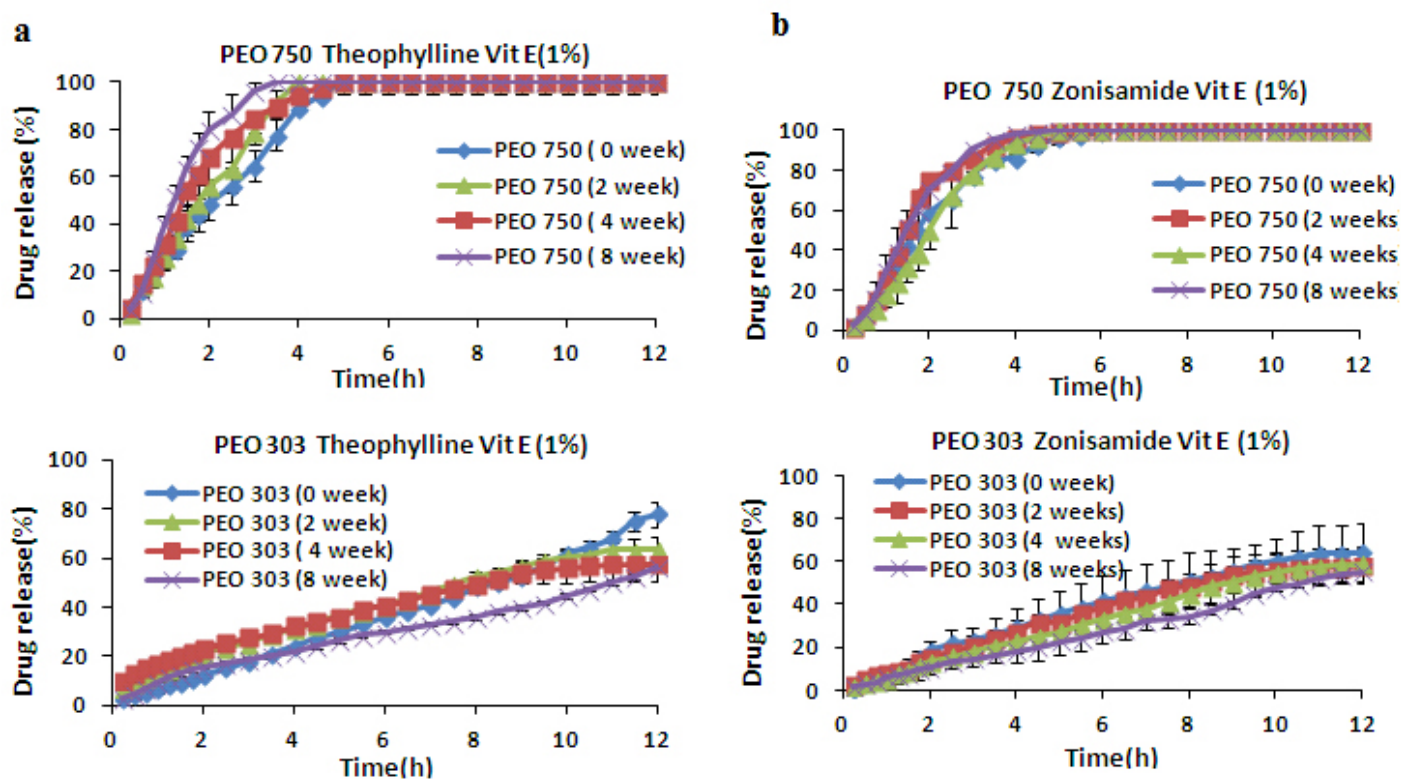


Fig. 2. Release profile of theophylline (a) or zonisamide (b) batches formulated with polyox 750 or 303 at 1:1 drug:polymer ratio, containing 1% w/w Vit E and stored at 40 °C.

Both the thermal degradation of polyox and the antioxidant efficiency of vitamin E within polyox matrices were dependant on the solubility properties of the drug formulated. Vitamin E is a good antioxidant to prevent degradation of polyox within matrices containing drugs with both high water solubility (e.g. propranolol HCl) and semi water solubility (e.g. theophylline) if the latter was formulated with polyox with high molecular weight (polyox 303). However, using of this antioxidant may not be necessary for polyox matrices formulated with drugs with low water solubility properties

(e.g. zonisamide) since no significant degradation of polymer was observed due to storage.

## **Publication**

[Investigation of Drug Release from PEO Tablet Matrices in the Presence of Vitamin E as Antioxidant.](#)

Shojaee S, Nokhodchi A, Cumming I, Alhalaweh A, Kaialy W.  
*Curr Drug Deliv.* 2015