Influence of polymer structure on controlled release of docetaxel: a comparison of non-bio degradable polymer films for esophageal drug eluting stents

Keywords:

Docetaxel, non-bio degradable polymers, controlled release, polymer structure, esophageal stent

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Palliation care by non-vascular stenting is commonly used to prolong the patency of esophagus lumen in esophageal cancer. The benefit of non-vascular stenting is often limited by stent reocclusion caused by tumor growth. Numerous attempts have been made to develop non-vascular stents as a localized drug delivery platform [1]. Docetaxel (DTX) is a member of taxanes class and is indicated for treatment of a wide range of cancers. As a result of DTXs high toxicity, low solubility in water and high potency [1, 2], it has been considered for localized drug delivery for esophageal cancer treatment. The aim of this study was to select the most appropriate DTX-polymer combination based on compatibility studies to fabricate the esophageal stent. DTX impregnated polymer films were prepared using silicone, non-degradable polyurethane (PU) and poly (ethylene-co-vinyl acetate) (EVA). The films were prepared using a solvent casting method, with various drug loadings; (1, 5 and 10% w/w). The chemical and physical properties of the films, including morphology, drug loading, thermal and mechanical characteristics and *in-vitro* release profiles of DTX from the films were interpreted in terms of the drug-polymer interactions. Furthermore, the rate of DTX degradation with the formulations under the release condition was also assessed. PU exhibited the expected sustained release of DTX (>45 days) with the low extent of DTX degradation. In conclusion, PU films show the best results for covering esophageal stents that could provide a controlled release of DTX locally.

1. Shaikh, M., et al., Mol. Pharmaceutics, 2015, 12 (7), pp 2305–2317.
2. Shakuto, S., F. Fujita, and M. Fujita, Cancer & chemotherapy, 2006. **33**(3): p. 337-343.