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## Characterization and aerolization properties of Carrageenan dry powder inhalers containing ibuprofen

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**Statement of the Problem:** Delivery via the lung represents a unique opportunity to circumvent the prostaglandin independent mucosal injury associated with the oral administration of NSAIDs, as it eliminates the direct GI exposures to these drugs. Furthermore, the pulmonary drug delivery route usually decreases the dose requirements by 10 to 20 folds. Additionally, a slower rate of respiratory decline is shown in cystic fibrosis patients on high, oral doses of IBU in comparison to placebo. Dry powder inhalation is the most versatile way of pulmonary administration of API. It allows numerous formulation variations and many different dry powder inhaler (DPI) devices to design a drug product matching therapeutic needs. The purpose of the present research was to formulate IBU dry powder inhalers (DPI) containing Carrageenan as a natural polymer and to indicate appropriate excipient and polymer to improve the aerodynamic properties of the DPI formulations.

**Materials & Methods:** Trehalose and leucine were dissolved in Carrageenan solution. IBU was added into the solution. The mixture was then sprays and dried with constant stirring using a Büchi Nanospray dryer B-90. The formulations were analyzed by thermogravimetry (Perkin Elmer 4000). The *in vitro* aerosolization performance was investigated using next generation impactor (Copley). *In vitro* dissolution studies were done with paddle over disc method USP apparatus 2.

**Results & Discussion:** Encapsulation efficiency and the Carr's Index increased with increasing Carrageenan. The highest encapsulation efficiency value was  $78.6 \pm 2.9$ . On the other hand, the process yield decreased with increasing carrageenan. The lowest process yield value was  $71.16 \pm 1.7\%$ . The fine particle fractions of the formulations were over  $37.8 \pm 3.2\%$  thanks to the nanospray dryer. The release of IBU was nearly complete within 8 hours with 1:1 drug: polymer.

**Conclusions:** In this study, IBU DPI containing carrageenan was obtaining with good process yield, aerolization properties and low cohesively

### Biography

Aysu Yurdasiper Erdem obtained her BSc and MSc degrees from Faculty of Pharmacy at Ege University, Izmir, Turkey respectively, followed by a PhD Degree from Department of Pharmaceutical Technology, Ege University. She has studied as a PhD Student with TUBITAK Scholarship in Cardiff University, Welsh School of Pharmacy, Cardiff, UK. Her work is focused on dry powder inhalers, dermal delivery (topical, transdermal drug systems), controlled release formulations (nanoparticles, microparticles) for drug delivery. She is Editor in Chief of *American Journal of Drug Delivery and Therapeutics*, also Editor on the Editorial Board of several international journals. She has filed a national patent on dry powder inhaler formulation. She has been working as a Researcher in Department of Pharmaceutical Technology, Ege University. Her current research interests focus on development of novel nanomedicine including polymers and *in vitro-in vivo* evaluation for treatment of asthma.

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