

Abstract

# $\beta$ -Cyclodextrins as Carriers for the Targeted Delivery of Pharmaceutical Substances against Lipase from *Malassezia* spp. †

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**Abstract:** Seborrheic dermatitis (SD) and dandruff are the most prevalent scalp diseases in populations around the world. The main etiopathogenetic factor of these diseases is an altered abundance of *Malassezia* species that secrete several lipases and turn acylglycerides into fatty acids associated with an inflammatory reaction, itching, and scalp dryness. The investigated synthetic and natural-based agents showed activity against *Malassezia* lipase, but they have low solubility and therefore bioavailability.  $\beta$ -cyclodextrins ( $\beta$ -CDs) and their derivatives are promising carriers and additives with which to improve the solubility of molecules and carry out possible targeted drug delivery. Therefore, this research aimed to evaluate the  $\beta$ -CD–lipase interaction as well as the influence of  $\beta$ -CDs on lipase activity. Modern methods are used to model the structural elucidation of  $\beta$ -CDs with lipase. In this study, transmission electron microscopy (TEM) showed that  $\beta$ -CD–lipase complexes were formed in the form of grape bunches to maintain stability. Additionally,  $\beta$ -CDs interacted with the active site and terminal subunits of lipase. Moreover,  $\beta$ -CDs changed the configuration of lipase in a dose-dependent manner, identified by UV spectroscopy and fluorescence assays. Furthermore, lipase activity, measured by oleic acid yield, was significantly decreased due to the presence of different  $\beta$ -CD concentrations. Thus,  $\beta$ -CDs strongly interacted with lipase and influenced its enzymatic activity, meaning that they could be considered as drug delivery systems for novel therapies of SD and dandruff.

**Keywords:** lipase;  $\beta$ -cyclodextrins; *Malassezia*; drug delivery; seborrheic dermatitis



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