Abstract

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Title of the thesis: Active Encapsulation of Imiquimod in Liposomes with Dendrimers

One of the main obstacles to tackle when dealing with drug delivery systems such as liposomes is efficiently loading adequate concentration of active ingredient. Drug encapsulation in liposomes occurs in two possible methods: passive and active loading. Passive drug loading involves the capture of drugs into the liposome whilst it is being prepared. Active loading however is the passage of drug through liposome's phospholipid bilayer after the liposome is fully formed. This method has been shown to be effective for low molecular weight ionizable active components and it was hypothesized to be an effective method of encapsulation of imiquimod. IMQ is an imidazole quinolone drug known for its extreme hydrophobicity and basicity and have been used for skin diseases (e.g. skin cancer).

During our approach, liposomes were prepared using the classical thin layer method while the lipids were hydrated with aqueous solution of in-house synthesized first-generation dendrimer of two different concentrations (5 mM and 10 mM). Once the liposomes were prepared, a pH gradient was formed between the liposomes's core and the liposomes' exterior by buffer exchange (PBS, pH=7.4). Multiple incubation conditions were tested (including changes in temperature, incubation duration, and the incorporation of mechanical stirring) to evaluate if the active loading of IMQ to liposomes is possible. Our results proved that active loading of IMQ to liposomes is depended on duration and stirring at specific incubation temperature. The highest IMQ concentration (1.24 mg/ml) observed for the liposomes which were created with 10 mM of dendrimers and incubated for 10 days at 60 °C without stirring.