A Thermoreversible Gel for Delivery of Immunostimulant

Shin, Jayden (School: West High School)

Pluronic F-127 (PF-127) is a thermoreversible hydrogel and a promising candidate for drug delivery. It has a unique property that allows it to turn from liquid to gel as the temperature increases. PF-127 can be explored as a drug delivery system to treat diseases, such as leukoplakia, a potentially cancerous oral disorder associated with smoking. The objective of this study was to determine the optimized relationship between concentration and temperature for successful PF-127 gelation, characterize its drug release kinetics, and assess the gel's toxicity to oral cells. PF-127 powder was dissolved in a saline solution to make concentrations ranging from 10% to 30%. The temperature was increased gradually to determine the precise temperature at which each concentration turned to gel. Concentrations under 16% were unable to turn to gel. In low 20% concentrations, PF-127 was a liquid at room temperature, which is suitable for injection applications where it will be a liquid in a vial and gelate once released into the body. In high 20% ranges, a gel at room temperature would be feasible to apply and control in topical applications. To characterize the drug release kinetics of PF-127, calf thymus DNA was loaded into PF-127. It showed sustained drug release over a prolonged period of time as opposed to a conventional release from an injection. Its release kinetics are preferable because it can steadily release an optimal concentration of a drug, preventing toxicity from high drug concentrations while maintaining therapeutic potential. An in vitro cytotoxicity test validated the low toxicity of the drug delivery system. My results broaden the possible applications of PF-127 as an anti-cancer drug carrier.