

PROPOSITION DE STAGE
Année Universitaire 2013 – 2014
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HDR : oui ou non

Ecole doctorale de rattachement :

Spécialité du stage : Recherche Professionnel

Indiquez par quelques mots clés, l'orientation scientifique du sujet :

Titre du stage :

Investigation of alternate polymers to poly(ethylene) glycol (PEG) Projects 1 and 2

Equipe : 1 investigateur principal (PI), 1 doctorant

Ce sujet constitue-t-il un premier pas vers un travail de thèse : Oui - Non

Description du sujet (quelques lignes):

Projects 1 and 2) Investigation of alternate polymers to poly(ethylene) glycol (PEG): Liposomes have been used in drug delivery since the 1970s. Drug delivery liposomes (DDLs) are composed of a phospholipid bilayer formed into an enclosed sac, that can both carry hydrophilic drugs in the internal water pocket, or hydrophobic drugs within the membrane, thus they are extremely versatile as drug carriers. The protective layer can be formed through inclusion of phospholipids that have been functionalized with a polymer into the liposome formulation, such that the polymers form a corona outside the liposome that acts as the stealth sheath. Currently the most commonly used polymer is poly(ethylene glycol) (PEG), and the liposome with a PEG sheath is known as a "PEGylated liposome". Such liposomes

extremely successful it is by no means perfect – bloodstream lifetime is extended from 1 hour to 1-2 days, however there is significant room for improvement as red blood cells and some antibodies circulate for months and the search for alternate protective polymers is an active field. There are two main classes of alternate polymers being investigated: polyoxazolines and carbohydrates. We mean to use molecular dynamics simulation, which we have already used to study the PEGylated liposome surface through the simulation of a section of PEGylated membrane, to study membranes functionalized with the alternate polymers, polyoxazolines, and carbohydrates.

Project 1) construction and simulation of a section with liposome membrane with two polyoxazolines polymethoxazoline and polyethoxazoline. The formulation of the liposomal membrane will contain cholesterol and be the same as the formulation of DOXIL but with the PEG replaced by the new polymers this project involves model building and simulation of the polymers

Project 2) project 2 is identical to project 1 except that instead of the polyoxazolines the polymers being tested belong to the carbohydrate family: hydroxyethyl starch, polydextran, and hyaluronan .

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