Functionalized Polymersomes for Trapping the Ebola Virus

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Statement of Purpose: The Ebola virus (Ebov) can cause hemorrhagic fevers and even death. Currently, there is no reliable treatment for Ebola. A series of studies have presented evidence that Ebov enters human cells after the virus glycoprotein (GP) binds to the endosomal membrane protein Niemann-Pick C1 (NPC1)[1,2,3]. This research believes that nanoparticles can be an effective treatment for Ebov due to their small size, increased surface area, and ability to be cleared from the body after Ebov capture. Building off of this excitement, we developed, for the first time, polymersomes functionalized with NPC1 to treat Ebov. Specifically, we used an Ebov mimic (which carries the GP from Ebov on its surface) to test the binding between them and, thus, provide a valid approach to treat Ebov.

Methods: The polymersomes of interest to the present study were made through a solvent injection method. In this research, the polymer used for the polymersomes was mPEG-PDLLA 5,000:50,000 Da. For this, 10mg of the polymer was dissolved and ultrasonicated in an organic solvent, which was injected into a stirring solution of 10mL PBS. This mixture was dialyzed for 48 hrs against pure PBS to remove the organic solvent. An Ebov mimic was purchased from the American Type Culture Collection (ATCC) while aminosilane chemistry was used to functionalize the surface of the polymersomes with NPC1. The functionalized polymersomes were characterized with scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS), and zeta potential.

Results: Results showed a uniform size of the polymersomes using the solvent injection method (Figure 1). It is speculated that the size of polymersomes created (less than 100 nm) will allow for optimal capture of Ebov and then removal from the body by natural mechanisms.

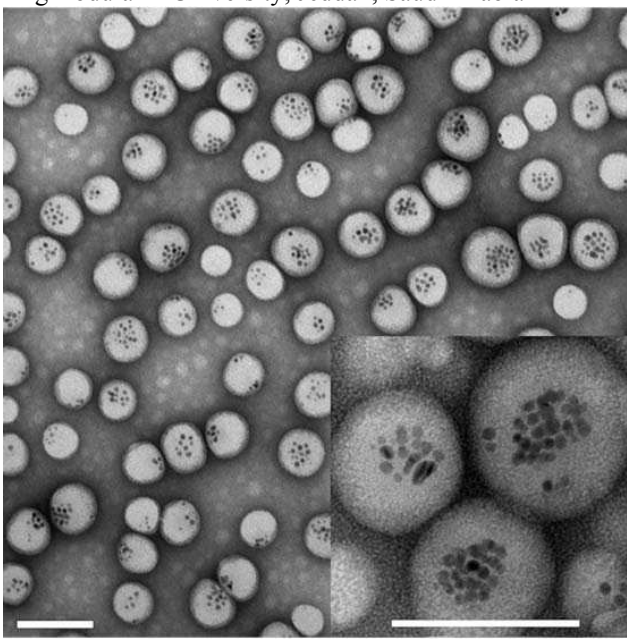

Figure 1: Transmission electron micrograph of the polymersomes created in the present study (scale bars = 100nm). Prior to imaging, particles were negatively stained with a 1.5% uranyl acetate solution and dried on a 300 mesh copper-coated carbon grid.

Results will also be presented demonstrating the ability of such functionalized polymersomes to target and remove the Ebov mimic.

Conclusions: The functionalized polymersomes were made and used to trap the Ebov mimic, thus, demonstrating promise for their continued study.

References:

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