Optimizing Nanosuspension Treatments for Nitrogen Mustard Gas Burns on the Skin

Catherine Rojas, Tomas Rolden, Patrick Sinko
Stockton University and Rutgers, The State University of New Jersey

The Sinko laboratory conducts research, as part of the CounterACT government initiative, for protection against chemical weapon attacks by optimizing treatments that are needed for medical intervention of mustard gas burns on the skin. The group focuses on an analog of sulfur mustard gas, nitrogen mustard, which is a bifunctional alkylator that damages DNA. Optimization includes studying drug dose escalation, while maintaining adequate stability, and increasing drug release rate so that the gel medication would only have to be applied on the wounds once daily (QD). Formulations are ultrasonicated which results in uniform and stable nanosuspensions that provide immediate release of the drug. Characterizations of the drug include dynamic light scattering, saturation solubility, TEM imaging, and in vitro release studies. Preliminary stress tests showed room temperature refrigerated suspensions were stable during treatment period, however at higher temperatures the drug was more unstable. This impacted the mice model results where the twice daily treated mice exhibited better wound healing than the QD treated mice. This suggests frequency and stability of the drug plays a key role in medical intervention for mustard gas burns. Future studies will include better formulations for QD mice to decrease the risk of infections and exposure. Supported by NIH R25ES020721 and U54AR055073.