Personalized Nanomedicine Tailored to Lung Cancer Metabolomic Analysis
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Introduction

Introduction:
- Encapsulating chemotherapeutics in nanoparticles (NPs) may minimize chemotherapy side effects, provide sustained-release, and decrease dosing. Cancer metabolomics enables a specialized view of each patient's cancer and may provide information to tailor personalized nanomedicine.

Objective:
- The long-term goal of this project is to modulate NP formulations to improve the release of active agents as a potential treatment modality. Software-based analysis of patients' metabolic profiles was performed from NSCLC biopsies as a first step towards synthesising the metabolomic data for NP-design purposes.

Methods:
- NPs encapsulating Rhodamine B were synthesized using either a nanoprecipitation or electrospraying technique with acetone or acetonitrile as solvents. NPs were evaluated based on yield, loading, and release profile. NSCLC patient metabolic data were analyzed using R Studio.

Results:
- Heat maps were created for a set of 22 patients, highlighting specific metabolites to consider for patient-specific NP design.
- The NSCLC metabolomic data in this study was previously obtained in collaboration with Dr. V van Berkel, Dr. D Miller, Dr. J Yan, Dr. X Zhang, and the CREAM facility at UofL.

Conclusions
- The electrosprayed NPs demonstrated higher yield (91%) and loading (43%) compared to nanoprecipitated NPs.
- Nanoprecipitation with polyvinyl alcohol (PVA) as a stabilizer in acetone had the highest sustained-release (78%) over 4 wk compared to the electrospray method (47%).
- Among the nanoprecipitation formulations, acetone with Tween 80 had the highest yield (81%), while acetone with PVA had the highest loading (30%).
- The metabolomics data may be useful in the era of personalized medicine in developing a decision tree for determining nanomedicine parameters optimized to patient tumor-specific metabolic parameters.

Acknowledgements
- Research was supported by the University of Louisville Cancer Education Program NIH/NCI R25-CA134283.
- This work was partially supported by the National Institutes of Health – National Cancer Institute (grant number R15CA203605 - H. Frieboes).
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