A Molecular farming approach to nanomedicine

Nicole F. Steinmetz[1,2,3]*

[1]Department of Biomedical Engineering, [2]Radiology, [3]Materials Science and Engineering, Case Western Reserve University School of Medicine, 10900 Euclid Avenue, Cleveland, OH 44106, USA.

*Corresponding author: nicole.steinmetz@case.edu

The use of nanoparticles for tissue-specific imaging and targeted drug delivery has shown great potential for detection and treatment of disease such as cancer. A quintessential key in nanotechnology is to self-assemble multifunctional nanoparticles with well-defined properties, i.e. morphology, size, charge, surface ligands. To facilitate high precision self-assembly we turned toward a bio-inspired approach, specifically plant viral nanoparticles (VNPs). Viruses have naturally evolved to deliver cargos (i.e. their genome) to specific cells and tissues. That means that they are natural experts at what engineers seek to do with nanomedical carrier systems. Genetic and chemical engineering can be used to add functional cargos, e.g. photodynamic or chemotherapeutic drugs, add targeting ligands for tissue-specificity, and/or imaging agents for optical or magnetic resonance imaging. In this presentation, I will discuss pre-clinical evaluation and application of engineered VNPs, such as icosahedral cowpea mosaic virus, rod-shaped tobacco mosaic virus, or filamentous potato virus X.

Acknowledgements: This work was supported by NIH/NIBIB grants R00 EB009105 and P30 EB011317, a Case Western Reserve University Interdisciplinary Alliance Investment Grant, a Case Comprehensive Cancer Center grant P30 CA043703 (NIH/NCI), Mt. Sinai Foundation, and Ohio Cancer Research Associates.