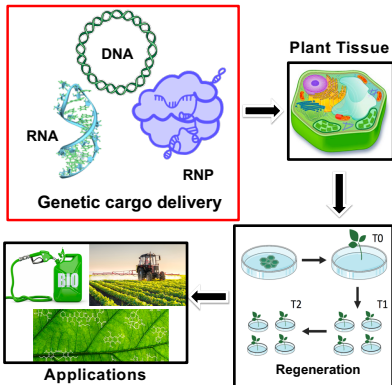
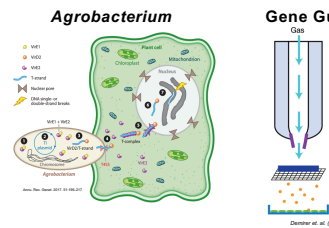


Motivation

Plant genetic engineering is poised to fortify several key industries



Existing plant transformation methods lack practical applicability, have a narrow host range, are toxic, and inefficient



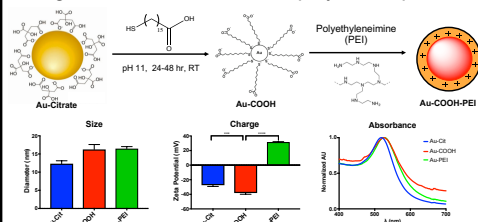
Research Objectives

- Design biocompatible vehicles capable of efficient transport into plant cells of mature leaves
- Tune physicochemical properties of carriers to screen for optimal formulations
- Integrate nanoplatforms into model plant systems to gauge gene silencing and expression efficiency

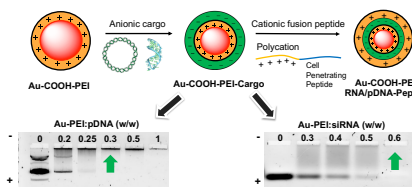
Nanoparticle Synthesis and Characterization

Approach 1: Electrostatic layer-by-layer siRNA and pDNA nanocarrier assembly

Carboxylation of AuNPs to obtain a stable negative surface for cationic polymer deposition

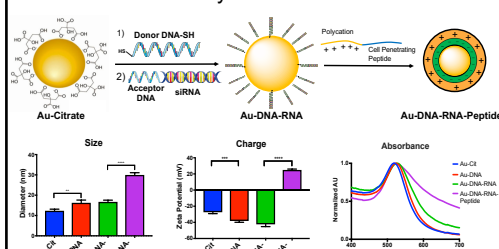


Successful loading of siRNA and pDNA onto engineered cationic nanoparticles



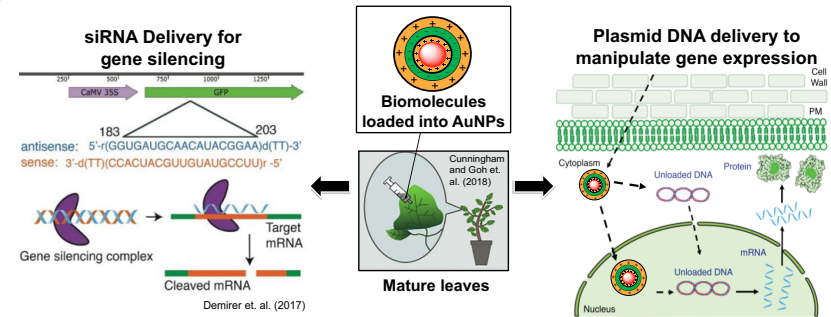
Approach 2: siRNA conjugation to AuNPs via complementary base pair hybridization

Thiolated Donor DNA attachment to AuNPs and hybridization to GFP siRNA



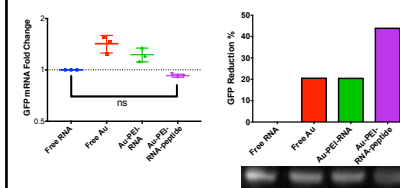
Methods and Results

Administration of Nanoparticles to Mature Leaves

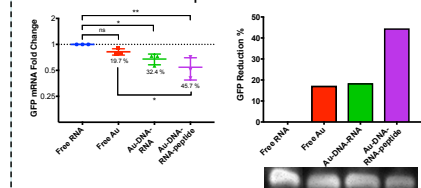


Preliminary results show GFP silencing in transgenic *Nicotiana benthamiana* leaves and conflicting results between mRNA and GFP levels

Approach 1: silencing at the protein level



Approach 2: silencing at the mRNA and protein levels



Approach 1: preliminary confocal imaging results show modest levels of GFP expression in wild-type *Nicotiana benthamiana* leaves



Conclusions and Future Work

We developed two nanoplatforms for the delivery of siRNA and pDNA to intact leaves. The following work must be conducted in the future:

- Repetition of all experiments with biological replicates to conclusively confirm or deny preliminary results
- Determination of critical AuNP toxicity concentrations to evaluate system scalability
- Evaluation of AuNP internalization into plant cells to gauge the platform's passive cell wall traversal capability
- Delivery of sgRNA to Cas9-expressing plants for precise plant genetic engineering

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