# Environmental and Water Resources Engineering, and Center for Water and the Environment Seminar Series Presents:

**Thursday, March 5th, 2026, 3:30-4:30 pm, ECJ 1.324**

*Zoom Link: https://utexas.zoom.us/j/84820581097*

## Extracellular RNAi Construct Removal via Nanoscale Cation Protein Aided Biofiltration


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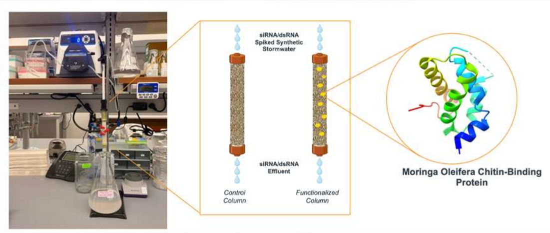


Traditional chemical pesticides have been associated with acute and chronic toxicity risks, driving interest in biopesticides that rely on RNA interference (RNAi) mechanisms to selectively control pest populations. However, concerns persist regarding the potential risks these biomolecules pose to non-target organisms including environmental microbes. Agricultural runoff extends the distribution of these constructs beyond the point of application, requiring new containment strategies to prevent transport across landscapes. This work expands upon the application of This work expands upon the application of *Moringa Oleifera* (*MO*) proteins for drinking water treatment to develop a comparable approach for removing RNAi constructs from agricultural runoff. This work evaluated the capacity of a model filtration system functionalized with *MO* proteins to remove short interfering RNA (siRNA, ~20bp) and double-stranded RNA (dsRNA, 460bp) constructs from synthetic stormwater. *MO*-functionalized sand filters significantly increased removal efficiency across all tested influent concentrations (2 - 20 ng/μL) compared to non-functionalized controls. RNAi removal in functionalized sand columns was further enhanced under slight acidic (pH = 5.7) conditions relative to neutral (pH = 7.0) conditions. In granular activated carbon (GAC) filters, RNAi removal was only significantly enhanced by MO proteins when influent RNAi concentrations exceeded 10 ng/uL due to GAC's inherently high adsorption capacity. Comparative analysis of siRNA and dsRNA removal indicated greater removal efficiency for small siRNAs, though this observation may be constrained by analytical detection limits. RNAi bioactivity assays demonstrated that exposure to pristine RNAi constructs induced antibiotic resistance phenotypes in *Pseudomonas putida*. Post-column bioactivity assays indicate that antibiotic resistance phenotypes were only detected concentrations exceeding 50 ng/μL, suggesting that filter breakthrough above a critical threshold can promote non-target effects. Findings suggest *MO* proteins serve as an effective and sustainable amendment to traditional filter media that meaningfully increase RNAi removal capacity. Future studies are needed to optimize filter design to suppress breakthrough and mitigate non-target effects associated with elevated RNAi concentrations.

## Characterizing OprP Transport of Phosphate in Model Membrane and Tissue Systems


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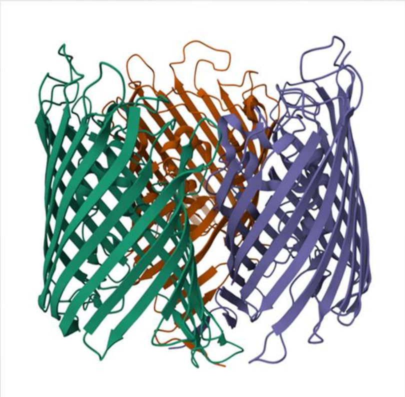

Phosphate is a relevant environmental pollutant that can cause significant problems in aquatic ecosystems if left untreated, such as algal blooms and eutrophication. It is also typically challenging to remove. Outer membrane protein P (OprP) is a potential solution to address phosphate in wastewater streams. It is a protein produced by P. aeruginosa to uptake phosphate when in phosphate-poor environments. Although it transports phosphate, it is also reported to transport chloride ions at a conductance than phosphates. In this study, bilayer- based model systems are used to determine OprP's viability as a phosphate-removing technology. The transport capabilities of OprP for phosphate and chloride are evaluated at the single channel scale using the droplet interface bilayer (DIB) model system. Its application in larger scale membrane technology can be evaluated using the novel Jammed Interconnected Bilayer Emulsion (JIBE) tissue model system. By determining the comparative conductance values of phosphate and chloride through OprP in the model bilayer and tissue systems, the efficacy of OprP for phosphate removal in a waste stream that contains both phosphate and chloride can be evaluated.

**EWRE Seminar Committee Members: Ana Lăcău, Ella Junker, Hani Ghamkhar, Julia Barkelew, Tzu-An Lee**
**Supervising Faculty: Dr. Ben Hodges**