Probing Cellular Processing of Peptide Amphiphile Micelle (PAM) Vaccines Utilizing Electron Microscopy

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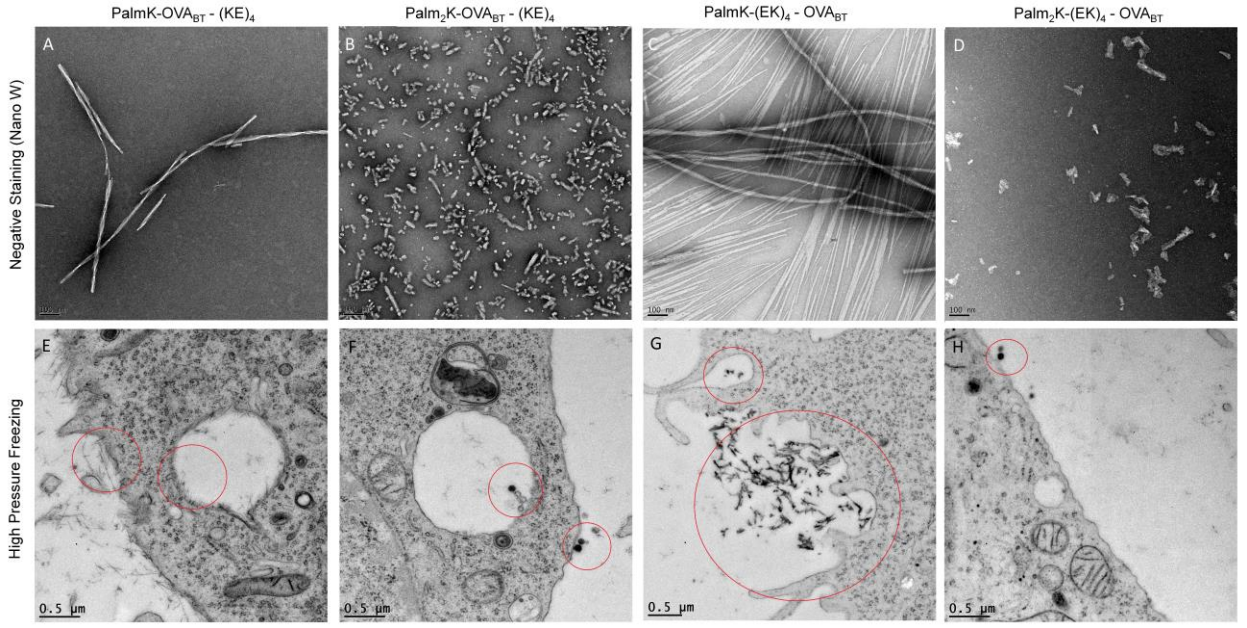
My research focuses on using peptide amphiphile micelles as subunit vaccines. Subunit vaccines are a new generation of vaccines that are considered significantly safer than traditional whole-pathogen vaccines. Subunit vaccines only deliver the pathogen component necessary to induce an immune response, thereby minimizing off-target effects that may be induced by other components.

My previous research uncovered design rules for controlling physical properties of peptide amphiphile micelles by utilizing a zwitterion-like region, poly (Lysine:Glutamici Acid) or $(KE)_4$ region. Though different peptide amphiphile micelles have shown interestingly different immunogenicity as vaccines, the mechanisms of which were yet to be understood. This EMC award provided me with a great opportunity to study the mechanism of how different peptide amphiphile micelles interact with cells. The experimental outcomes obtained from these mechanistic studies aided in a better understanding of how peptide amphiphile micelles can interact with biological systems. This more complete knowledge will lead to a better understanding of how to design peptide amphiphile micelles as therapeutics for the treatment of varies diseases.



Morphological characterization of 4 different peptide amphiphile micelles by utilizing TEM negative staining (A-D). Capturing the interaction between different peptide amphiphile micelles and macrophages via high pressure freezing, micelles are marked with red circles (E-H).