Department of Chemistry and Biochemistry
Worcester Polytechnic Institute

Wednesday, January 14th, 2026
12:00 PM
Gateway Park 1002

Dr. Victor Adebomi

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"FROM SYNTHETIC INNOVATION TO AI-DRIVEN DESIGN: A JOURNEY IN CYCLIC PEPTIDES AND MINI-PROTEIN THERAPEUTICS."

My research brings together chemical biology, synthetic methodology, high throughput screening, and artificial intelligence to advance the discovery of next generation peptide therapeutics. During my PhD in Monika Raj's lab, I developed new strategies for selective peptide modification and macrocyclization, including the CyClick reaction, an exclusively intramolecular process that forms a rigid 4 imidazolidinone turn and prevents unwanted peptide dimer and oligomer formation. This enabled the creation of tag free cyclic peptide libraries and a complementary sequencing workflow that allowed the discovery of functional binders, including ligands for a monoclonal antibody and the HIV capsid protein. I also developed a chemo selective and site selective method for amide bond activation and carbon carbon bond formation in complex peptides, guided by density functional theory calculations. As a postdoctoral scholar at the Institute for Protein Design, I expanded this work into computational design by helping create deep learning models that generate peptide and mini protein structures from scratch and optimize them for tight binding. Using these tools, I designed highly potent inhibitors of Bacteroides fragilis toxin and validated their activity in cellular models. Altogether, my work establishes an integrated pipeline that spans synthetic innovation, high throughput discovery, and artificial intelligence guided molecular design to create programmable cyclic peptides and mini proteins that target biologically important protein interfaces.

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