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The emergence of antibiotic-resistant bacteria poses a substantial health threat to humans. As conventional antibiotics are losing their potency, alternative solutions are urgently needed to combat bacterial infections. Bacteria use complex membrane-embedded protein assemblies called nanomachines to acquire nutrients, adhere to various surfaces and cells, and expel toxins from and inject effectors into host cells. Thus, these nanomachines are essential for bacterial virulence and survival, enabling infection and colonization of specific niches. In the Liu Lab, I use cryo-electron tomography to investigate the in situ structural biology of bacterial nanomachines involved in protein secretion and adhesion. Combined with knowledge acquired from biochemical and genetic studies, we aim to reveal key mechanistic insights needed to impair virulence by disrupting the functions of these nanomachines, a promising alternative route to treat bacterial infections without provoking resistance.

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