

AI-Designed Proteins for Bacterial Domestication

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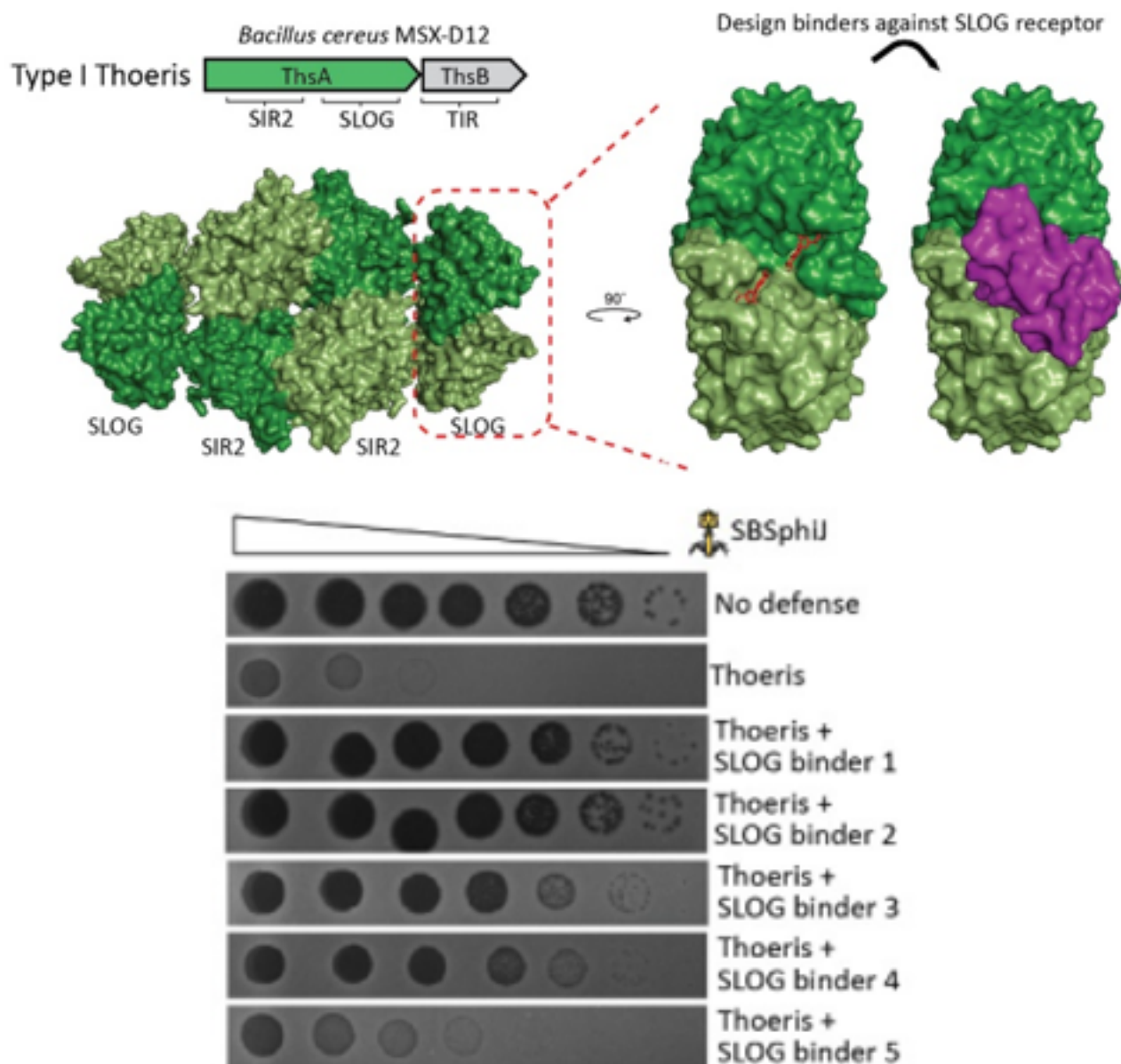
Overview

Bacterial defense systems often block plasmid delivery, limiting strain engineering and biomanufacturing. This technology uses AI-driven protein design to create synthetic anti-defense proteins that neutralize bacterial immunity and enable efficient transformation of previously resistant strains. The platform unlocks broad genetic access to industrial and synthetic biology hosts, accelerating development of engineered microbes for R&D and production.

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Applications

- Enabling efficient transformation of previously untransformable bacterial strains
- Increasing plasmid delivery and expression efficiency in industrial hosts
- Expanding the genetic toolbox for microbial engineering and synthetic biology
- Supporting strain optimization for biomanufacturing, fermentation, and R&D



Synthetically designed proteins against Thoeris system from *Bacillus cereus* MSX-D12 is capable of overcoming Thoeris defense.

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Differentiation

- First de-novo designed inhibitors of bacterial defense systems
- Short, modular proteins enabling multiplex inhibition in one phage
- Applicable across diverse bacteria and defense types
- Fully synthetic and rapidly designable using AI-driven tools

Development Stage



Proof-of-concept achieved: synthetic anti-defense proteins validated biochemically and in vivo, demonstrating effective inhibition of native bacterial defense mechanisms. The approach restored plasmid uptake and phage functionality in *Bacillus*, *E. coli*, and *Vibrio* strains.
