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Hyperstable synthetic miniproteins as ligand scaffolds

Hyperstable synthetic miniproteins as modular ligand scaffolds for advanced therapeutics and diagnostics.

IP Status: Provisional Patent Application Filed

Applications

- Molecularly targeted therapeutics
- Diagnostic tools
- Radiotherapy
- Biopharmaceuticals

Key Benefits & Differentiators

- **Enhanced Stability:** Superior stability compared to natural proteins, ensuring better performance under physiological conditions.
- **Improved Delivery:** Smaller size allows for better penetration in solid tumors, efficient blood vessel extravasation, and greater pharmacokinetic flexibility.
- **Modularity:** Facilitates the creation of multifunctional therapeutic agents like bispecific T-cell engagers (BiTEs), trispecific killer cell engagers (TriKEs), and antibody-drug conjugates (ADCs).
- **Reduced Background:**Faster clearance from non-targeted areas reduces toxicity during radiotherapy and ADC applications and reduces background in PET imaging.

Technology Overview

The development of targeted therapeutics and diagnostics is often limited by the structural complexity and size of antibodies, which can impede effective tumor penetration and physiological transport. Traditional ligands used in these applications frequently exhibit inefficient performance in complex molecular targeting, particularly in creating multifunctional agents such as BiTEs, TriKEs, and ADCs. These limitations necessitate the development of novel ligand scaffolds that are both stable and versatile, capable of enhancing the efficacy of targeted therapies and diagnostic tools.

Researchers at the University of Minnesota have developed hyperstable synthetic miniproteins (~40 amino acids) that function as versatile ligand scaffolds. Unlike natural protein sequences, these synthetic miniproteins are engineered to enhance molecular binding efficiency and stability. This innovation offers significant advantages in modularity, enabling the development of multifunctional therapeutic agents, improved tumor delivery, and simplified synthesis.

Phase of Development

TRL: 3-4
The researchers are currently validating dozens of scaffolds, thousands of binding ligands, and multiple biological targets.

Desired Partnerships

Technology ID
2023-269

Category
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Researchers

- **Ben Hackel, PhD** Professor, Department of Chemical Engineering

References

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2. Paul L. Blanchard, Brandon J. Knick, Sarah A. Whelan, and Benjamin J. Hackel(2023) , https://pubs.acs.org/doi/10.1021/acssynbio.3c00409, ACS Synthetic Biology, 12, 3608-3622