

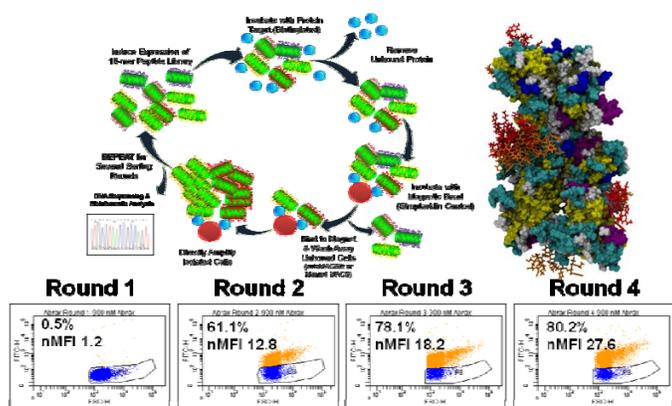


S&T Campaign: Materials Research Biological and Bio-inspired

Dr. Dimitra Stratis-Cullum, (301) 394-0794
dimitra.n.stratis-cullum.civ@mail.mil

Research Objectives

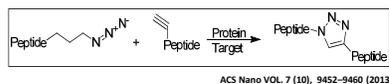
- Integrated biocombinatorial and *a priori* in silico approach, for on-demand discovery of **robust** peptide reagents (in response to new threats)
- Unprecedented design control and performance for synthetic capture materials in complex environments through a combination of epitope targeting and iterative screening catalyzed by the target itself.



Protein Selective Peptides Discovered in Less than a Week

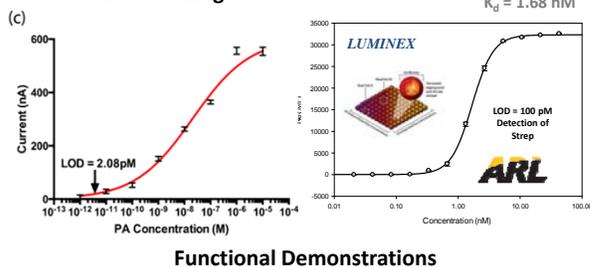
Challenges

- Affinity and selectivity comparable to monoclonal antibodies (pM-nM)
- Zero batch-to-batch variability
- Scale up through robotic methods
- Amenable for integration into any detection platform
- Can be synthesized as linear and cyclic
- Use of non-natural amino acids for improved chemical stability & function
- Extreme chemical and thermal stability
- Epitope targeting for site specific inactivation or paired reagent development

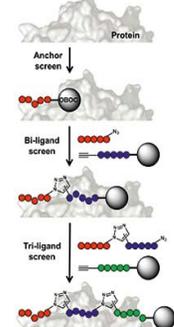


ACS Nano VOL. 7 (10), 9452-9460 (2013)

Iterative Screening Process



Functional Demonstrations



Related Related ARL Publications

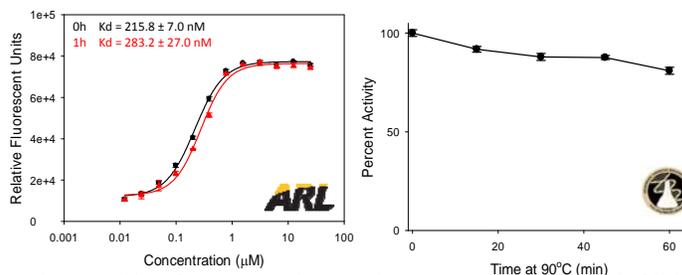
XPairIt Docking Protocol for peptide docking and analysis Molecular Simulation doi:10.1080/08927022.2015.1025267 (2015)

Method for Discovery of Peptide Reagents Using a Commercial Magnetic Separation Platform and Bacterial Cell Surface Display Technology. J. Anal Bioanal Tech 6: (2015)

"A Chemically Synthesized Capture Agent Enables the Selective, Sensitive, and Robust Electrochemical Detection of Anthrax Protective Antigen", ACS Nano, 2013, 7 (10), pp 9452-9460.

ARL Facilities and Capabilities Available to Support Collaborative Research

- In house facilities & expertise for discovery, development and evaluation of extremely stable (protease resistant, extreme thermostability), and highly manufacturable peptide reagents for diagnostics, biosensing, and other bio-applications
- Titan 357 split-and-mix automated peptide instrument for preparing combinatorial libraries of natural and non-natural peptides for high throughput screening. Characterization methodologies include Biacore SPR, and Luminex multiplex assays.
- Specialized modeling and simulation tools for bio-bio interactions (*a priori*), using **secure** DOD High Performance Computing Facilities
- Leveraging partnerships with Caltech and InDi Molecular for PCC technology transition, and ECBC for standardized testing



Thermostability of a PCC Agent discovered against Protective Antigen. (Left) The reagent shows minimal loss in binding after 1 h at 70°C and (Right) retains over 80% binding activity after 1 h at 90°C.

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- Postdoctoral researcher(s), students, visiting scientist opportunities
- Seeking collaborations in microfluidics for semi-automated bead/library sorting
- Potential collaborations in defense diagnostics and sensing platforms; larger-scale partnerships in wearable/smart skin/fabrics/devices and other applications
- Potential collaborations in computational modeling and design to include non-natural and exotic chemical systems