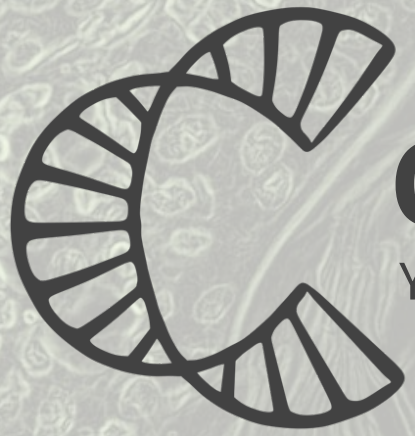


CELL ORIGINS

Your Partner in Phage Display

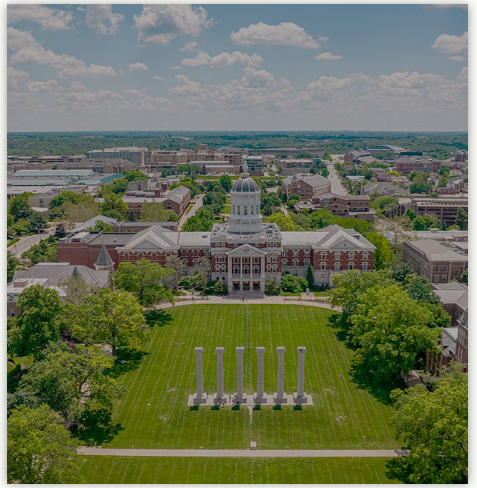
UNLOCK YOUR PEPTIDE DISCOVERIES

At Cell Origins, we believe discovery is personal. As a *boutique* CRO specializing in peptide discovery through phage display, we combine world-class scientific expertise with one-on-one collaboration. Every project is a true partnership, grounded in precision and trust, tailored to your goals, and driven by a shared commitment to innovation.

OUR ORIGINS

WE ARE PASSIONATE ABOUT PHAGE DISPLAY!

Cell Origins was founded in 2019 by a team of scientists with deep roots in phage display. Our founders are alumni of the University of Missouri, the birthplace of phage display technology, where they trained under the pioneers of the field. With this legacy, we're not just continuing a tradition, we're evolving it to meet the next generation of therapeutic discovery.



MEET OUR TEAM

You collaborate directly with the people who shaped the field.

Mette Soendergaard, PhD

Innovator in Phage Display Design

Brings leadership in phage display innovation, with a distinct focus on strategic selection design and precision targeting of cancer biomarkers. A recognized expert in the field, she drives the evolution of phage display platforms, refining innovative peptide discovery and designing novel libraries.

Jessica Newton-Northup, MS

Expert in Translational Peptide Discovery

Brings 25 years of hands-on expertise in phage display, with a focus on identifying cancer targeting peptides. Her work has contributed to over 30 peer-reviewed publications and numerous successful grants. At Cell Origins, she applies her experience to perfect phage display in the laboratory.

LeAnn Qi, MBA

Strategic Scientific Ventures

Brings deep expertise in guiding the business side of early-stage biotech ventures, with a track record spanning grant strategy, financial innovation, and product positioning. At Cell Origins, she shapes the company's strategic direction and oversees business operations with a focus on precision and impact.

PEPTIDE & ANTIBODY DISCOVERY

With the rapid growth of the therapeutic peptide markets, phage display has become an essential engine for discovery, uniquely suited to uncovering high-affinity binders with translational potential.

HIT MOLECULES NOT CONVERTING TO LEADS?

While phage display consistently yields promising hits, the journey from binder to viable lead remains fraught with complexity. Many candidates fall short due to suboptimal specificity, inadequate potency, or poor pharmacokinetic profiles.

OUR STRATEGY

At Cell Origins, we don’t stop at identification, we specialize in refinement. Our precision-engineered phage display strategies bridges the critical gap between hit discovery and lead optimization, accelerating your path to functional, clinically relevant candidates.

Through close, one-on-one collaboration, we gain deep insight into your biomarker target and intended application. This allows us to craft a custom phage display strategy built for your goals, ensuring translatable results.

MULTI-TIER

We design a custom, multi-tier phage display strategy for each target, meticulously eliminating non-specific binders and layering selections across environments. This refined approach yields peptides with enhanced specificity, optimized pharmacokinetics, and greater translational relevance.

CASE STUDY 1

SCIENTIFIC OBJECTIVE

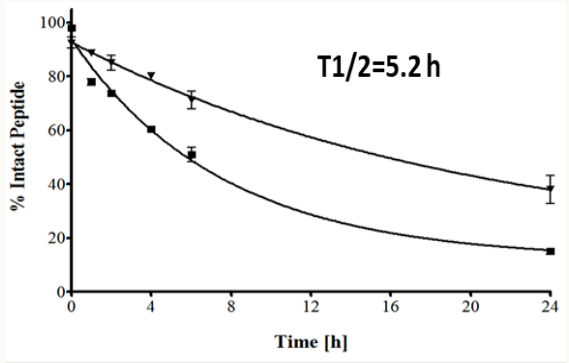
To identify a peptide that selectively targets human ovarian tumors with optimal *in vivo* stability and pharmacokinetics—to overcome the limitations of recombinant protein models.

OUR TAILORED STRATEGY

We developed a refined, multi-tier phage display workflow to address the limitations of recombinant-only selections. The strategy included preclearing in healthy mice, *in vivo* selection against xenografted tumors, and direct selection using freshly isolated tumor cells—preserving native antigen context across all tiers.

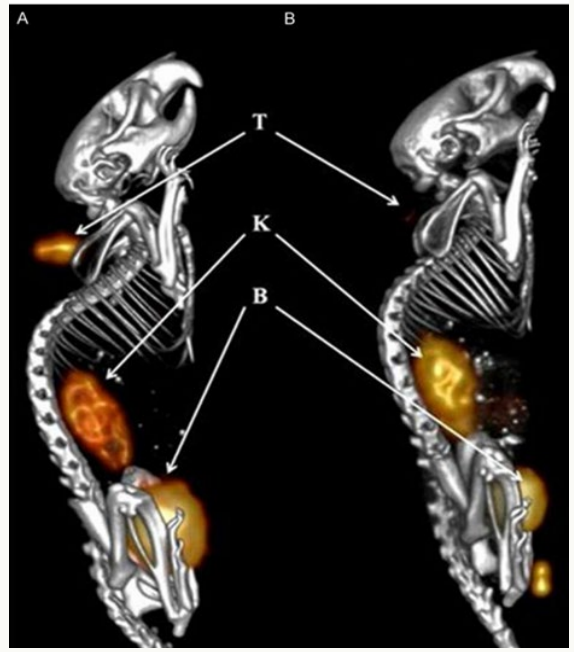
OUTCOME

This approach yielded a lead peptide with exceptional tumor specificity, high stability, and a favorable biodistribution profile—positioning it as a strong candidate for systemic therapeutic applications.



Mouse serum (■) and HEPES buffer (▼) at 37°C.

Time	Tumor/muscle	Tumor/blood
0.5 h	5.10	0.69
1 h	9.40	1.61
2 h	18.56	8.67
4 h	7.45	0.54



^{111}In-DOTA-peptide and (B) In-DOTA-peptide followed by ^{111}In-DOTA-peptide were injected into xenografted mice. Images were acquired 1 h post-injection. T=tumor, K=kidneys and B=bladder.

Multi-tier approach delivers a peptide optimized for ovarian tumor targeting and *in vivo* performance.

Soendergaard M, *et al*. In vivo phage display selection of an ovarian cancer targeting peptide for SPECT/**CT** imaging. Am J Nucl Med Mol Imaging. 2014 Sep 6;4(6):561-70.

CASE STUDY 2

SCIENTIFIC OBJECTIVE

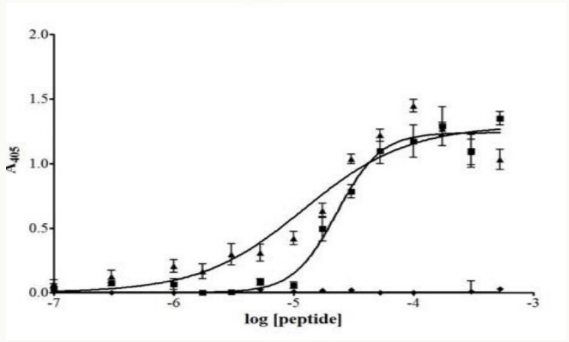
To accelerate the discovery of tumor-targeting peptides by integrating cell-based selections—ensuring that identified candidates retain functionality in physiologically relevant contexts.

OUR TAILORED STRATEGY

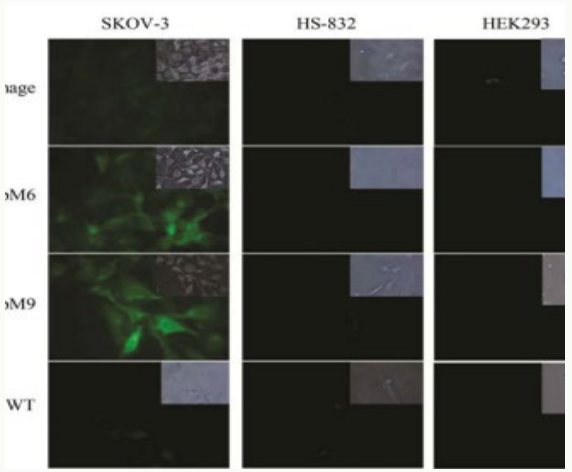
We applied an *in situ* phage display approach using a human ovarian cancer cell line as the selection target. By incorporating live-cell binding steps, we enriched for peptides capable of recognizing native cell surface structures. Selected clones were evaluated via imaging in mouse xenograft.

OUTCOME

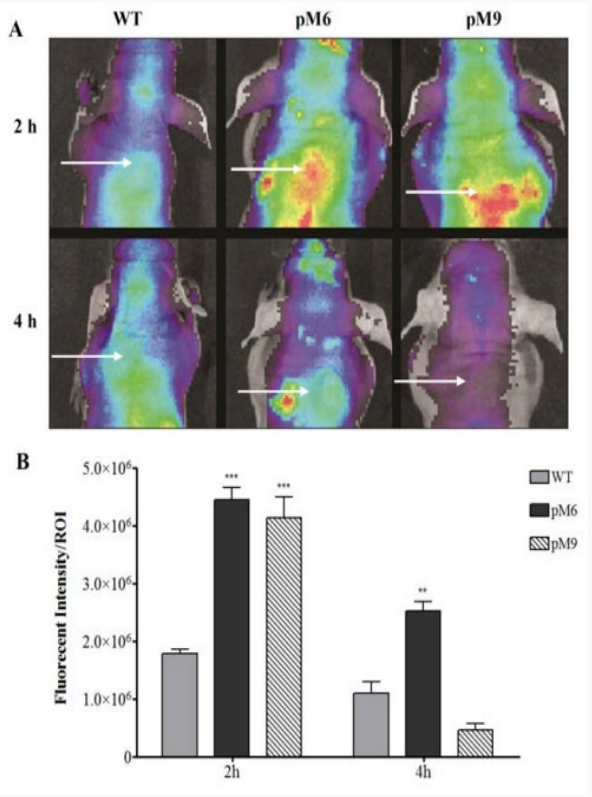
Phage-displayed peptides demonstrated selective accumulation in xenografted tumors, validating their ability to home to cancer cells *in vivo*. This approach supports faster identification of translationally viable targeting ligands.



Peptides showed specific binding in a dose-response assay in the lower umolar range.



Selected phage clones pM6 and pM9 show specific binding to SKOV-3 cells.



Peptides that fail to target tumors when displayed on phage fail to exhibit tumor-targeting and proper pharmacokinetics when used as soluble ligands. Thus, *in vivo* screening of NIR-labled phage clones was used to rapidly evaluate the tumor-targeting properties of phage display selected phage clones.

Cell-based screening ensures selected peptides retain tumor-targeting performance post-selection.

Soendergaard M, Newton-Northup JR, Deutscher SL. In vitro high throughput phage display selection of ovarian cancer avid phage clones for near-infrared optical imaging. Comb Chem High Throughput Screen. 2014;17(10):859-67

CASE STUDY 3

SCIENTIFIC OBJECTIVE

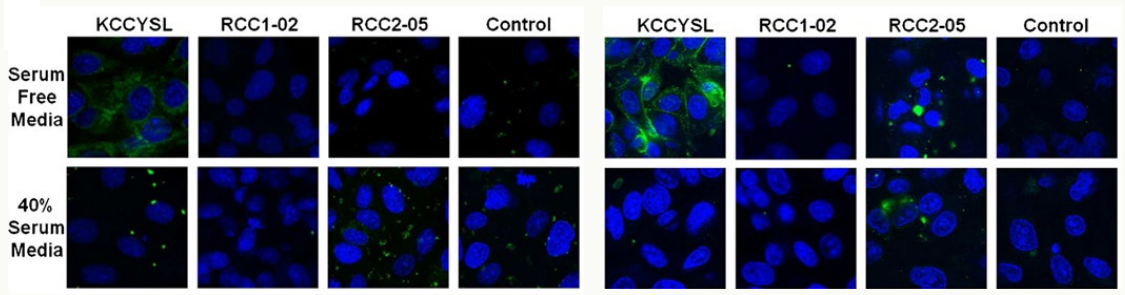
To overcome a key barrier in peptide drug development: off-target retention in the kidneys and liver. The goal was to discover peptides with favorable pharmacokinetics and rapid systemic clearance.

OUR TAILORED STRATEGY

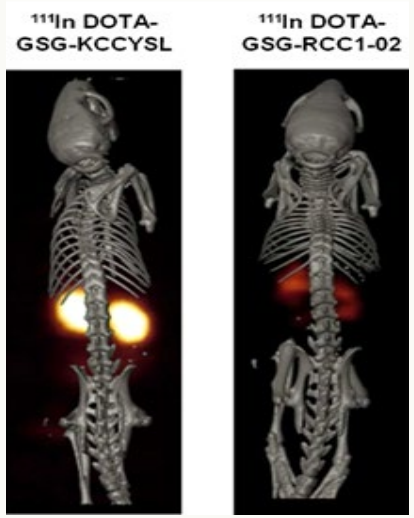
We employed an *in vivo* phage display approach to enrich for peptide sequences with reduced kidney accumulation. To support translation, we developed a custom *in vitro* assay predictive of renal retention, and conducted full pharmacokinetic profiling of selected clones.

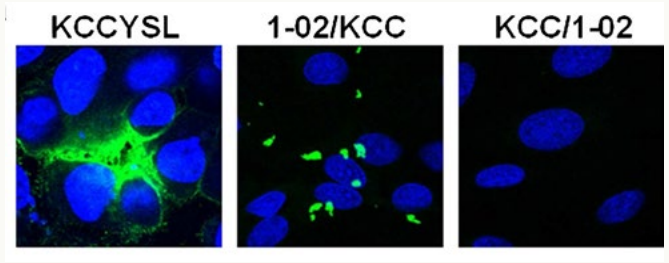
OUTCOME

Peptide RCC1-02 demonstrated significantly reduced kidney retention compared to control peptides in mouse models, validating its potential for use in therapeutic designs requiring rapid clearance and low off-target exposure.



Binding of phage and peptides to kidney cells with or without BSA competition. BSA reduced binding of known megalin/cubilin ligand KCCYSL, but not RCC1-02 or RCC2-05.(Left) Phage binding; (Right) Biotinylated peptide binding.





Left: Pharmacokinetic and SPECT/CT imaging studies of ^{111}In-labeled peptides show that the selected peptide is excreted via the RES, but does not bind to the tissue.

Above: Cell binding analysis of KCCYSL and RCC1-02 fusion peptides show that the selected sequences reduce kidney binding of KCCYSL.

In vivo phage display enables selection of peptides with reduced kidney retention and improved clearance.

Newton-Northup JR, Dickerson MT, Kumar SR, Smith GP, Quinn TP, Deutscher SL. In vivo bacteriophage peptide display to tailor pharmacokinetics of biological nanoparticles. Mol Imaging Biol. 2014 Dec;16(6):854-64. doi: 10.1007/s11307-014-0762-z. PMID: 25001195.

CASE STUDY 4

SCIENTIFIC OBJECTIVE

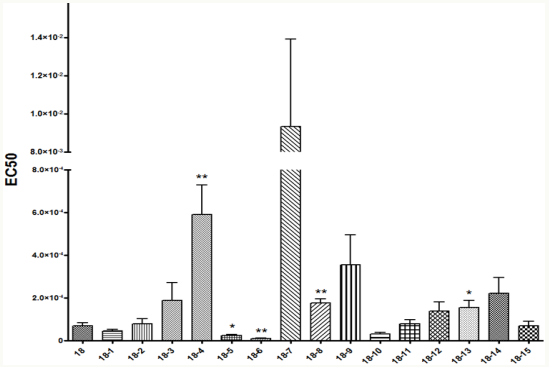
To enhance the binding affinity of a cancer-targeting peptide through structure-guided optimization—transforming a promising lead into a high-performance candidate.

OUR TAILORED STRATEGY

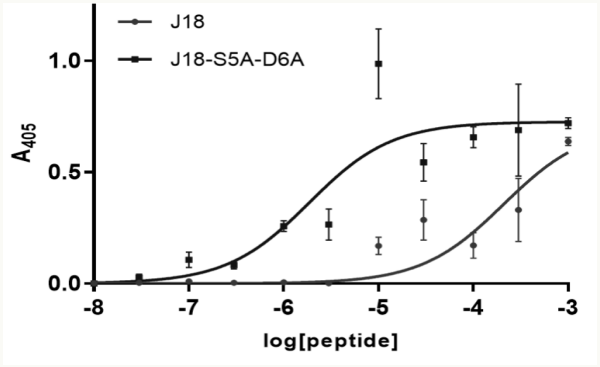
We employed alanine scanning to identify key residues contributing to target engagement. Substitution of serine-5 (S5) and aspartic acid-6 (D6) revealed a dramatic impact on binding. Based on these insights, we designed a dual-substitution variant, J18-S5A-D6A, to test for synergistic affinity gains.

OUTCOME

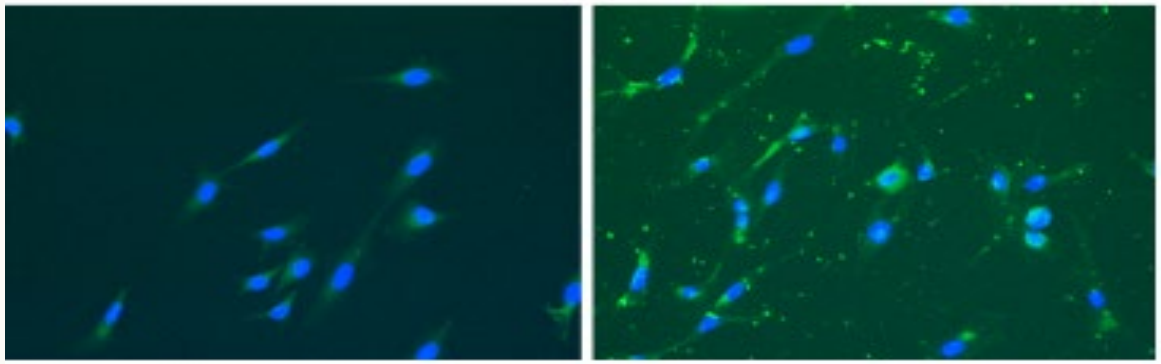
The engineered J18-S5A-D6A variant exhibited an EC_{50} approximately 100-fold lower than the parent peptide—validating the power of minimal, rational substitutions for precision tuning of peptide performance.



Sequential alanine scanning of a cancer-targeting peptide. EC_{50}-values were determined using an *in situ* dose-response assay. Two substitutions resulted in significantly improved binding affinities.



A double-alanine substitution of the peptide J18-S5A-D6A was evaluated and compared to the original peptide J18 using a cell-based ELISA. The EC_{50}-value of the maturated peptide was decreased by approximately 100-fold.



Fluorescent microscopy of the original peptide (left) and the double-alanine substituted peptide (right) showing improved binding to the target cell line.

Structure-guided peptide engineering yields a 100-fold increase in target binding affinity.

Soendergaard M., *et al.* Unpublished data.

CASE STUDY 5

SCIENTIFIC OBJECTIVE

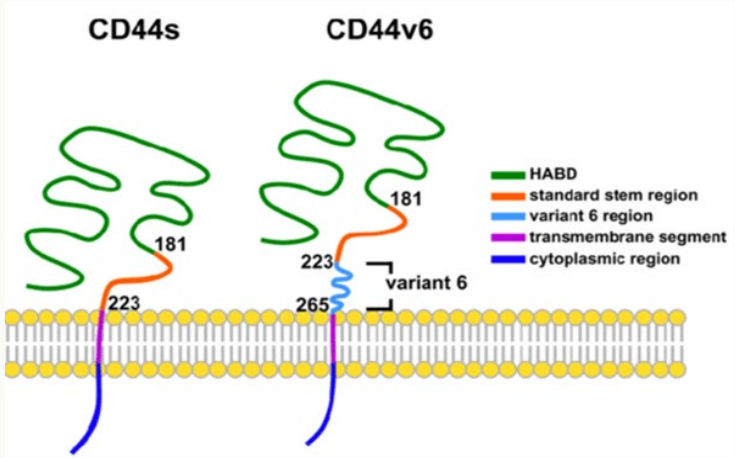
To selectively target CD44v6—a small, conformationally sensitive epitope—by preserving its native structure throughout selection, enabling the development of peptides with clinical relevance.

OUR TAILORED STRATEGY

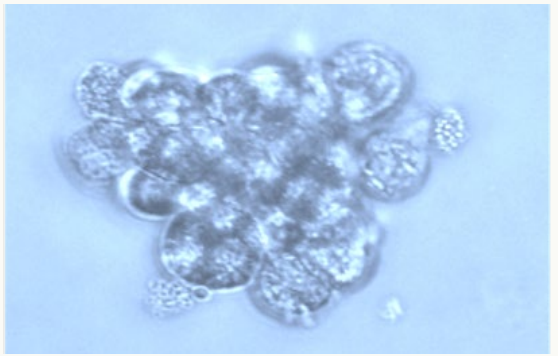
We implemented a multi-tier phage display strategy that included preclearing against off-target signals and selection on cultured cancer stem-like cells expressing native CD44v6. This was followed by validation against recombinant CD44v6 to confirm direct epitope engagement.

OUTCOME

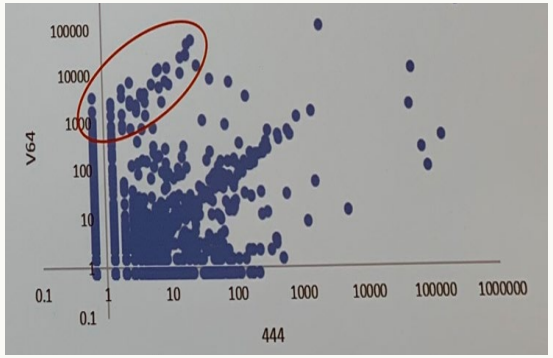
The strategy yielded peptides with high specificity for CD44v6, demonstrating the effectiveness of combining native and recombinant selection environments when targeting cryptic or spatially constrained epitopes.



CD44v6 is a biomarker of cancer stem cells. Recombinant CD44 and CD44v6 were used for the *in vitro* selection.



Cancer stem cells were used for the *in situ* selection.



NGS, Log2 data transformation, and bioinformatic analysis was used to identify peptides.

Multi-tier phage display strategy enables precise targeting of a small, clinically relevant epitope.

Soendergaard M., *et al.* Unpublished data.

END-TO-END DISCOVERY

Tailored to Your Pipeline

Strategic Discovery Consulting

- Target selection & validation
- Discovery workflow
- Prioritization of hit molecules
- Protocol design

Customized Phage Display

- Custom libraries
- Multi-tier strategies
- Selection tuned for affinity, specificity, PK

Candidate Identification

- High-throughput screening
- Clone characterization
- Binding kinetics (ELISA, BLI, SPR, and more)

Lead Optimization

- Affinity maturation
- PK and BioD profiling
- Off-target reduction via *in vivo* models

Every project is personal. Every solution is shaped through partnership.

WHY CELL ORIGINS?

A Boutique Team, Personally Committed to Your Discovery.

Scientific Depth

Gain immediate access to decades of phage display innovation, from library construction to in vivo selection, guided by scientists who've authored the methods behind your molecules.

Boutique Collaboration

You'll collaborate directly with our founding team. We listen, adapt, and co-create, so every experiment aligns with your goals and moves you closer to clinical impact.

Translational Precision

We deliver optimized peptide and antibody candidates—refined for binding, specificity, pharmacokinetics, and translatability—so you get leads, not liabilities.

Let’s explore how we can support your next discovery!

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