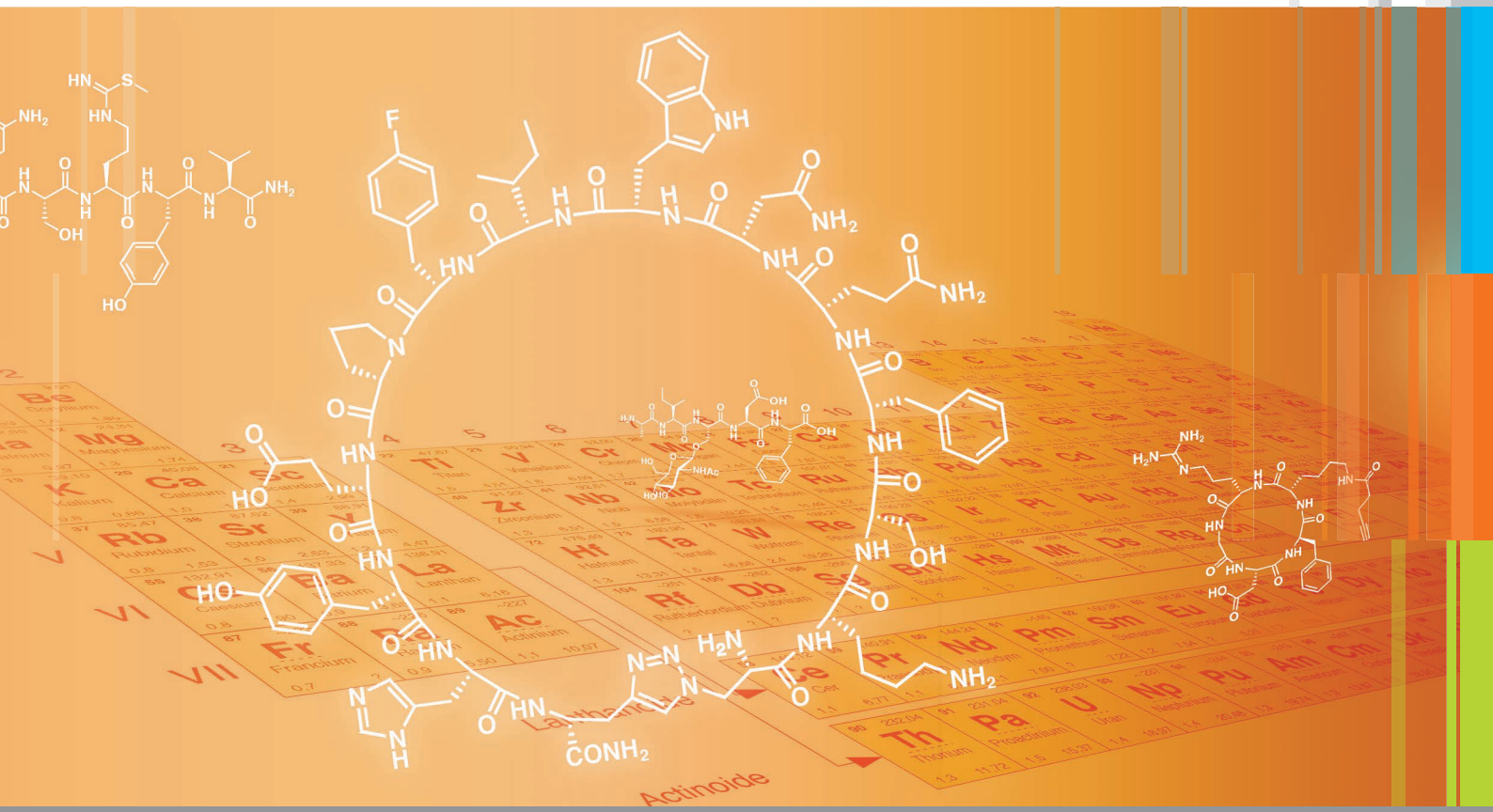
Innovative Peptide Solutions



Custom Peptide Services

- Custom & Specialty Peptides
- Clinical Peptides
- Peptide Libraries
- Peptide Pools
- Peptide Arrays
- Peptidomimetic & Organic Synthesis

jpt
Innovative Peptide Solutions

History

JPT Peptide Technologies is a service provider located in Berlin, Germany that has achieved worldwide credibility for its commitment to rigorous quality standards and a reputation for developing and implementing innovative peptide-based services and research tools for various applications.

Together with its US-subsidiary JPT serves its clientele in the pharmaceutical and biotechnology industries as well as researchers in universities, governmental and non-profit organizations.

Technology & Application

Over the past decade JPT has developed a portfolio of propietary technologies as well as innovative products and services that have helped to advance the development of new immunotherapies, proteomics and drug discovery.

Quality Assurance

JPT is DIN EN ISO 9001:2015 certified and GCLP audited.

TÜVRheinland CERTIFIED
Management System
ISO 9001:2015
www.tuv.com
ID 9105022388

JPT's key technologies are:

Custom & Specialty Peptides

We are peptide experts with a track record of more than 20 years and offer the largest variety of peptide chemistries, formats and modifications.

PepMix™

Defined antigen spanning peptide pools to stimulate $CD4^+$ and $CD8^+$ T-cells.

PepTrack™

Peptide libraries of individual peptides offering various specifications and optimization for different types of assays.

Clinical Peptides

Custom peptides produced for the stringent requirements of cellular therapy as well as vaccine and drug development.

PepStar™

Peptide microarray platform for antibody epitope discovery, monitoring of humoral immune responses, protein-protein interactions and enzyme profiling.

SPOT

High-throughput peptide synthesis for T-cell epitope discovery , neo epitope qualification and peptide lead discovery.

SpikeTides™

Light and stable isotope-labeled or quantified peptides for mass spectrometry based proteomics assays.

SpikeMix™

Stable isotope-labeled peptide (SIL) pools used as peptide standards in mass spectrometry based assays.

Health
made in Germany

Table of Contents

Choose JPT for all peptide needs!

We are the Peptide Experts!

JPT has a substantial track record providing custom peptides, peptidomimetics, and proteins to the global scientific community. We produce peptides in a range of purities, at different quantities, with and without modifications.

We have 99% Success Rate!

We select and optimize our synthesis and purification methods and techniques for every synthesis. Therefore, we have a very high success rate (over 99%). We go the extra mile to get your peptides done!

Our Service is the Best!

We offer quick and personal consultation with experienced scientists and help you with the selection of peptide specifications, provide tips for storage, solvents and more. Take advantage of our rush order service for urgent projects.

Our Quality Controls

JPT provides the most comprehensive portfolio of state-of-the-art analytical quality control procedures for peptides such as HPLC-MS, UPLC-HR-MS, MALDI-MS, ESI-TOF-MS, AAA, NMR, content determination and many more.

Proprietary Technologies by JPT

We developed several proprietary technologies that enable a wide range of applications and uncomparable prices. In addition, we offer the widest product portfolio of peptide-related products in the market.

Certified Quality Standards

For more than a decade JPT's operations run under a quality management system based on the latest ISO 9001 standards.

We fulfill highest health and environmental standards and invite our customers to inspect our facilities.

Let's talk about:

Peptide Purity

Even small impurites may create huge problems in certain assays. However, the impact of such by-products depends strongly on your specific application. Therefore, it is essential to choose the appropriate purity level.

- Tell us about your application to select the best specification for your peptides!

Solubility

Ever had the problem to dissolve a peptide or having limited solvent choices? How about using our help to predict the solubility of a peptide in advance and selecting the peptide sequences that work best? Or let us do a complete solubility test to find the best solvent?

- Talk to us!

Value

We work hard to meet your budget. Our patented technologies enable cost effective and tailored quotes for your specific application!

Delivery Time

We appreciate that your time is precious and work hard to keep agreed timelines. Any delays will be communicated promptly.

Stability & Storage

Most peptides are stable for years, if stored correctly. However, about 20 % of peptides have a limited shelf stability! But how do you recognize and handle potentially unstable peptides? We have the tools and the long term data to do so.

- Ask us!

Peptide Content & Net Weight

Peptide purity is measured by HPLC. In addition to side products analyzed by HPLC, peptides contain non-peptidic components. The quantification of those is essential to accurately adjust peptide concentration.

- Ask us to get fast and inexpensive access to the real peptide content.

Difficult Peptides

Most peptides are assembled by automated synthesis and purification. However, many peptides are difficult to isolate due to their unique physicochemical properties. Our goal is to deliver **every** peptide and we never stop if an initial synthesis fails.

- Ask us to learn about our strategies for difficult peptides.

Custom & Specialty Peptides

Custom Peptides

We do not just synthesize peptides. JPT and its staff have considerable knowledge in providing high quality peptides for all applications. We are able to meet the most challenging synthesis projects because we are the peptide experts for more than 20 years!

Our Service Includes

- Consultation with experienced scientists
- Help with peptide specifications
- Optimized peptide synthesis methods and protocols
- Reliable quality control using state-of-the-art techniques
- Competitive prices

Custom Peptide Scale

Our minimum order for custom peptides is 1mg and we are able to deliver up to several grams. For peptide libraries with smaller amounts, refer to SpikeTides™ and PepTrack™.

Aliquoting & Pooling

Ask for our aliquoting and validated pooling services!

Custom Peptide Purity Options

- unpurified (peptide is detected by MS)
- unpurified with guarantee (target peptide is main product)
- > 70 % (HPLC-MS)
- > 80 % (HPLC-MS)
- > 90 % (HPLC-MS)
- > 95 % (HPLC-MS)
- > 98 % (HPLC-MS)
- > 98 % (UPLC-HRMS)

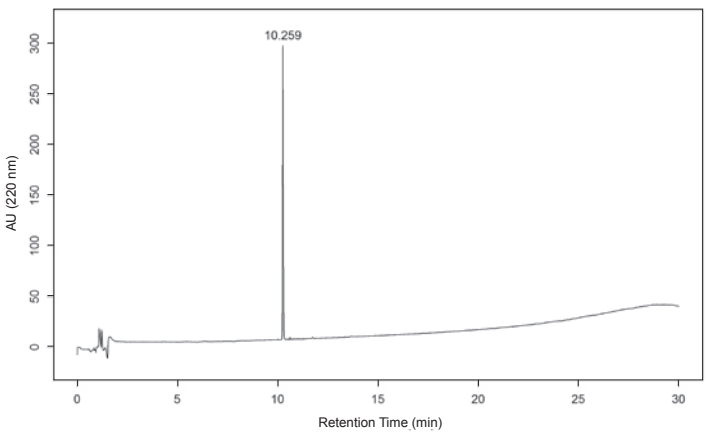
Quality Control Options

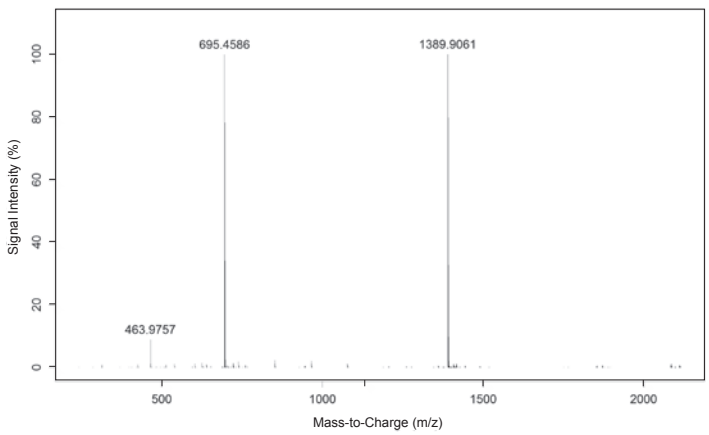
We provide quality control for each peptide by MS or HRMS, HPLC or UPLC and offer a wide range of additional analyses for custom peptides, e.g.

- Amino acid analysis
- Peptide content determination
- NMR
- Solubility and stability tests
- Endotoxin and sterility testing

Quality control of custom peptides. We provide the analytical data with each peptide.

Left: UPLC spectrum of peptide H-LAQLLLILSHIR-OH. Right: HRMS spectrum of peptide H-LAQLLLILSHIR-OH.





Selected References

- *"Characterization of RA839, a Non-covalent Small-molecule Binder to Keap1 and Selective Activator of Nrf2 Signalling"*
  Winkel et al., J Biol Chem. (2015)
- *"Structural Insights into the Intertwined Dimer of Fyn SH2"*
  Huculeci et al., Protein Sci. (2015)
- *"Effects of Polymorphic Variation on the Mechanism of Endoplasmic Reticulum Aminopeptidase 1"*
  Stamogiannos et al., Molecular Immunology (2015)
- *"IgG Antibody Responses to Recombinant gp120 proteins, gp70V1/V2 Scaffolds and a CyclicV2 Peptide in Thai Phase I/II Vaccine Trials using Different Vaccine Regimens"*
  Karasavvas et al., AIDS Res Hum Retroviruses. (2015)
- *"Histone H2AX Y142 Phosphorylation is a Low Abundance Modification"*
  Hatimy et al., International Journal of Mass Spectrometry (2015)
- *"η-Secretase Processing of APP Inhibits Neuronal Activity in the Hippocampus"*
  Willem et al., Nature (2015)
- *"Thrombin-induced Lysosomal Exocytosis in Human Platelets is Dependent on Secondary Activation by ADP and Regulated by Endothelial-derived Substances"*
  Södergren et al., Platelets (2015)

"The RV 144 HIV trial is considered as one of first successful HIV vaccine trials. It has become clear that the V2 loop of gp120 is an important site for immunogenicity and protection from HIV infection. The use of JPT's PepStar™ Microarray technology has been very useful for the correlation of the clinical outcome with humoral immune responses. As have the cyclic peptides been from JPT to validate these findings!"

J. Currier, Walter Reed Army Institute, Rockville, Maryland, USA

Specialty Peptides

We are experts in designing and producing modified peptides, labeled and cyclic peptides as well as other peptide modifications such as various peptide conjugates and peptide esters. We ensure that the most appropriate methods and techniques are selected for every peptide synthesis project. For many years our customers have grown to rely on our exceptional quality and reliability.

Our Service Includes

- Consultation with experienced scientists
- Development of a synthesis strategy by peptide chemists
- Production of building blocks
- We do not give up! Our success rate is > 99 %

Capabilities

- Synthesis of building blocks that are not commercially available
- Peptide design and optimization
- Extended organic synthesis facilities
- Solution and solid phase techniques
- Conjugation of peptides to shuttle molecules, biologicals, carbohydrates and adjuvants
- Stabilizing peptides by: cyclizations, disulfide and thioether bridges, incorporation of structures, creation of stapled peptides
- Unusual modifications, peptide bond isosters, click chemistries and more

Selected References

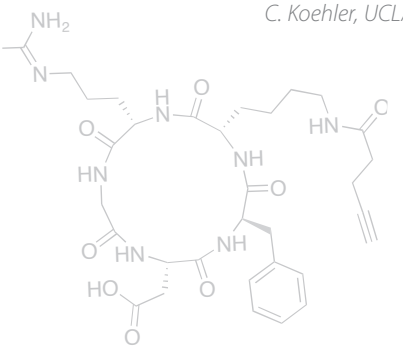
"STAT3 in CD8+ T Cells Inhibits Their Tumor Accumulation by Downregulating CXCR3/CXCL10 Axis"
Yue et al., Cancer Immunol. Res. (2015)

"Development and Characterization of Pepducins as Gs-biased Allosteric Agonists"
Carr et al., J Biol Chem. (2014)

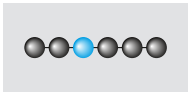
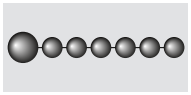
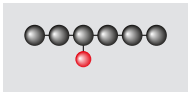
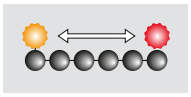
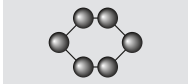
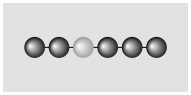
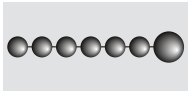
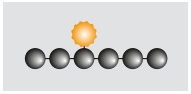
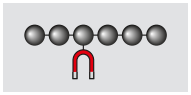
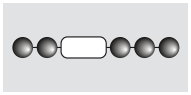
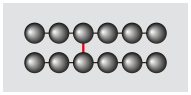
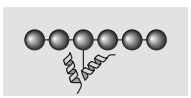
"Characterization of SnO2-Based 68Ge/68Ga Generators and 68Ga-DOTATATE Preparations: Radionuclide Purity, Radiochemical Yield and Long-term Constancy"
Sudbrock et al., EJNMMI Research (2014)

"Our research relies heavily on developing robust high-throughput screens with fluorescent peptides. We have found that JPT's are the best on the market because the signal-to-noise ratio is very high, providing the sensitivity we need for the screens. Their peptides always perform well. In addition, the knowledge, wonderful customer support, and fast turnaround time provided by JPT have been invaluable in us develop the best peptides for our assays."

C. Koehler, UCLA, Los Angeles, CA, USA



Peptide modifications and their common uses

Modification	Applications	Examples
 **Unnatural, Unusual Amino Acids**	• Increase activity, selectivity and plasma stability in drug discovery • Induction or stabilization of secondary structures e.g. helices, sheets, turns	• D-amino acids, homo amino acids, N-methyl-, beta amino acids, gamma amino acids • Hydroxyproline, beta-alanine, citrulline, ornithine, pyroglutamic acid
 **N-Terminal Modifications**	• N-terminal acetylation to imitate the natural structure in a protein • Stabilization towards enzymatic degradation by exopeptidases	• Acetylation, urea, carbamate, sulfonamide, alkylamine • Radioligands like DOTA, NOTA, NODAGA • Dyes and quenchers
 **(PTMs) Post-translational Modifications**	• Study of transcription, cell division, apoptosis, signal transduction, cell adhesion, cell growth, infection, immunological differentiation, bacterial proteins • Cys modifications for various applications e.g. proteomics experiments	• Methylation at arginine or lysine • Lys(GG) • Phosphorylation and phosphate analogs • Glycosylation • Pam3Cys, sulfonic acid • Methionine sulfoxide
 **Internally Quenched / FRET Peptides**	• Enzymatic assays • FRET experiments	• Free of fluorescent impurities • Large variety available, e.g. Abz/ Dnp, Mca/ Dnp, EDANS/ Dabcyl, FAM/ Dabcyl
 **Cyclic Peptides**	• Mimicry of secondary structures • Optimization of peptides (increased binding potency, selectivity, protease stability)	• Head-to-tail cyclization • Side-chain-to-side-chain • Head-to-side-chain • Side-chain-to-tail cyclization
 **Isotope-Labeled Peptides**	• See SpikeTides™ *(⇢ p. 16)* and SpikeMix™ *(⇢ p. 18)*	• Heavy lysine (U-13C6; U-15N2) • Heavy arginine (U-13C6; U-15N4)
 **C-Terminal Modifications**	• C-terminal amide to imitate part of a parental protein sequence • No additional charges in the peptide	• Acid, amide, ester, aldehyde, pNA, Amc, hydrazide, CMK, biotin, labels and dyes
 **Fluorescent Dye Labeled Peptides**	• Protein binding studies • Localization experiments	• Examples: Abz, FITC, FAM, Alexa Fluor, TAMRA, Mca, Dylight, Cy3, Cy5
 **Biotinylated and Tagged Peptides**	• Detection of tagged peptides (e.g. with labeled antibodies) • Separation of tagged peptides from untagged ones	• Biotin, desthiobiotin • Flag, Myc, HA tags • Tat, oligo arginine tags • Linkers and spacers
 **Linker / Spacer / PEGylations**	• Enhancing stability and bioavailability of peptides *in vivo*	• Beta-alanine, O1Pen, Ahx, O2Oc, Ttds, PEG with various lengths
 **Peptide Dimers**	• Increase in affinity (e.g. GPCR ligands) • Increased immune response (MAPs)	• Chemoselective dimerization methods by formation of Cys-maleimide thioethers, disulfides or triazoles
 **Protein Conjugates / Immunogenic Peptides**	• Generation of anti-peptide antibodies	• KLH, BSA, HSA, OVA

Clinical Peptides

Our enhanced production environment for Clinical Peptides & Pools goes beyond ISO 9001:2015 regulations to meet the more stringent product requirements of immunotherapy as well as vaccine and drug development. Thus, the resulting Clinical Grade & ISO Plus Peptides & Pools have been approved for specific clinical trials in the USA and in Germany.

Quality Assurance and Control

- Vendor qualification
- Incoming material inspection
- ADCF policy
- Cleaning validation
- Full traceability
- QC/QA documentation
- Batch release control

Optional Analyses

- Chemical analyses acc. to ICH guidelines, e.g. residual solvent and peptide content determination, amino acid analysis, UPLC measurement, stability and solubility testing
- Microbiological analyses, e.g. endotoxin and bioburden determination, sterility testing, bacteriostatic and fungistatic effect

Why choose JPT?

- More than 20 years experience on peptides as drugs, vaccines and for cell therapies
- Comprehensive know-how and dedicated staff make us the peptide experts
- QC beyond ISO 9001:2015 regulations
- Track record of successful clinical peptide projects
- Publication record of clinical trials using JPT

"We recently demonstrated the feasibility and clinical benefit associated with the infusion of rapidly generated single-culture VSTs, manufactured using JPT's Clinical Grade PepMix™ Peptide Pools covering 12 immunogenic antigens from five viruses (EBV, AdV, CMV, BK, and HHV6). When administered to 11 allogeneic stem cell transplant recipients, 8 of whom had up to four active infections, these VSTs produced an overall 94% response rate."

A. M. Leen, Baylor College of Medicine, Houston, TX, USA

Quality Levels

Specification	ISO 9001:2015 RuO	ISO 9001:2015 Clinical Grade
Applications	**Epitope Discovery & Immune Monitoring**	**T-Cell Expansion & DC Pulsing**
Incoming Material Inspection	x	x
Vendor Qualification	x	x
ADCF Policy	x	x
Batch Release	x	x
Certificate of Analysis	x	x
Document Management & LIM-Systems	x	x
Cleaning Validation		x
Line Clearance		x
Delivery in Certified Vials		x
Optional Services: Residual Solvents; Sterility, Endotoxin; Monitored Storage…	x	x

Selected References

- *"Peptide-stimulated Expansion of Virus-specific T cells for Preventative Treatment After Allogeneic Stem Cell Transplantation"*
  Gary et al., AppNote (2015)
- *"Activity of Broad-Spectrum T Cells as Treatment for AdV, EBV, CMV, BKV, and HHV6 Infections After HSCT"*
  Papadopoulou et al., Sci Transl Med. (2014)
- *"Broadly-specific Cytotoxic T Cells Targeting Multiple HIV Antigens Are Expanded From HIV+ Patients: Implications for Immunotherapy"*
  Lam et al., Molecular Therapy (2015)
- *"Expanded Cytotoxic T-cell Lymphocytes Target the Latent HIV Reservoir"*
  Sung et al., Journal of Infectious Diseases (2015)
- *"Ex vivo Expansion of Human T cells for Adoptive Immunotherapy Using the Novel Xeno-free CTS Immune Cell Serum Replacement"*
  Smith et al., Clinical & Translational Immunology (2015)

Peptide Libraries & Peptide Pools

JPT is the leading worldwide provider of peptide libraries and pools. We offer a variety of modifications and specifications to comply with all assay formats in applied immunology, proteomics and drug discovery. We produce according to DIN ISO 9001:2015 regulations and in compliance with good clinical laboratory practices (GCLP).

Peptide Library Formats

- Peptide purities from crude to > 98 %
- Scales from nmols to grams
- Number of peptides up to one million
- Peptide length variable depending on library platform
- Various modifications available (e.g. PTMs, labels, biotin)
- Delivery formats (e.g. microtiter plates, tube racks)

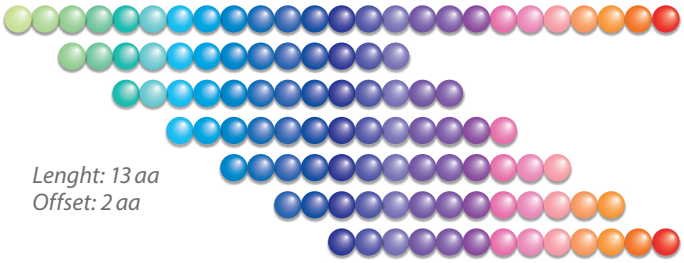
Select Your Peptide Platform

Peptide Platform	Peptide Specification	Assay Type
PepTrack™	Purified peptides with and without post-translational modifications (glycosylation, methylation, phosphorylation, acetylation and more)	Cell-Based Assays (ELISPOT, ICS, etc.)
PepMix™	Premade peptide pools for infectious or tumor antigens (protein spanning overlapping peptides)	T-cell assays (ELISPOT, Flow cytometry, ICS)
BioTides™	Biotinylated peptides (e.g. for immobilization to streptavidin coated beads, membranes, microarrays)	Binding Assays (Biacore, ILB, Microarrays, etc.)
Enzyme Substrate Sets	Peptides containing phosphorylation or cleavage sites	Enzymatic Assays
SpikeTides™	Proteotypic peptides unlabeled or heavy isotope-labeled with or without quantitation	SRM/MRM Assays
PepTrack™	Peptides labeled with fluorescence dyes of varying absorption and emission wavelengths	Fluorescence Based Assays
Micro-Scale Peptides	Large numbers of small scale peptides at low cost	High-Throughput Screening
Histone Code Peptide Sets	Library of biotinylated and non-biotinylated histone peptides with numerous post-translational modifications	Protein-Histone Interaction Studies
SpikeTides™ Sets and SpikeMix™	Premade sets and mixes for specfic protein families, e.g. tumor associated antigens, peptide hormones, metabolic enzymes or cytokines	MRM/SRM Assays
Our Peptide Library Solution	Discuss your specific requirements with JPT's peptide experts	Your Assay Requirement

JPT's peptide libraries range from economic small scale libraries consisting of unpurified peptides to specific and complex collections of purified peptides. They vary in amounts, QC/QA measures as well as peptide modifications including phosphorylation, alkylation, glycosylation and many more.

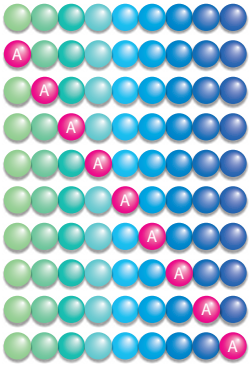
Selection of JPT's Peptide Library Types

Overlapping Peptide Scan



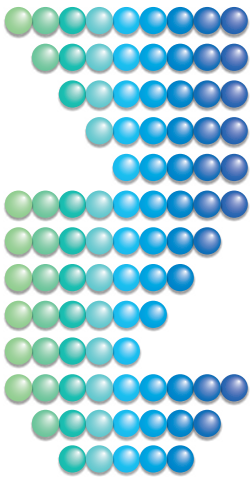
An overlapping peptide scan is generated to identify epitopes, substrates or other binding sites within a given protein sequence. A free and easy-to-use tool for generation of overlapping peptide sequences can be found on our website (www.jpt.com/support/software).

Alanine Scanning Analysis



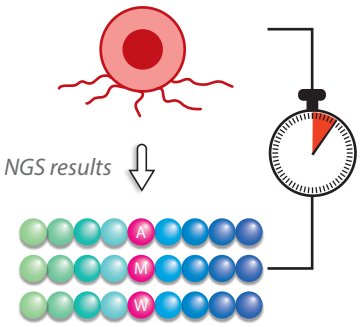
Each residue is substituted for an alanine enabling identification of key residues in your peptide sequence.

Truncation Analysis



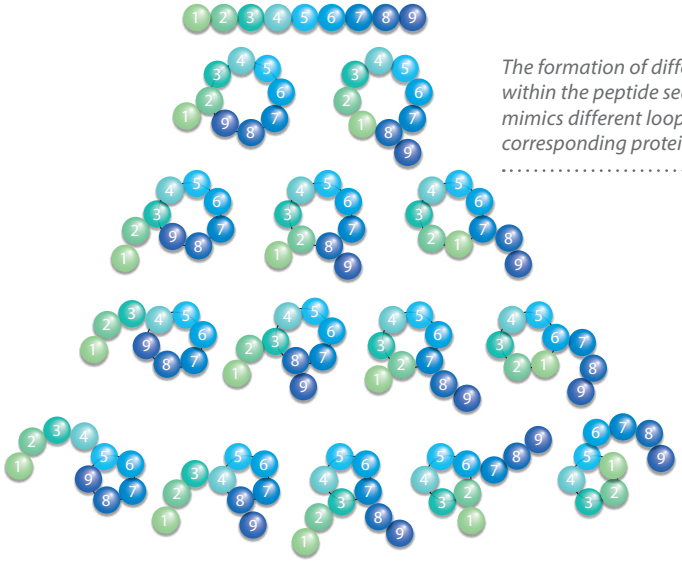
Truncation of the peptide sequence from both termini results in identification of the minimum epitope, substrate or binding motif.

Neo Epitope Library



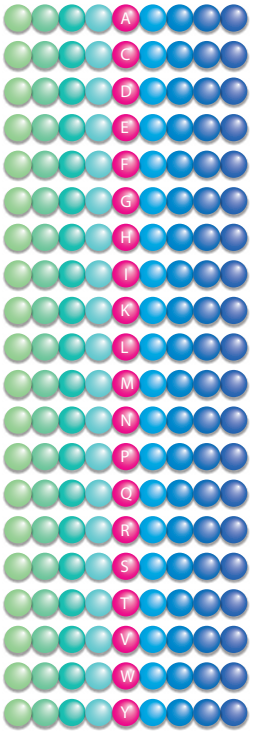
Fast assembly and pooling of neo epitopes directly from NGS results.

Cyclization Library



The formation of different cycles within the peptide sequence mimics different loops within the corresponding protein.

Positional Scanning Analysis



One or all residues within the peptide are replaced by all 20 natural amino acids (or modified ones, analogs and others) to identify motifs within consensus sequences.

PepTrack™ Peptide Libraries

Our customized peptide libraries offer unlimited flexibility. They are optimized for antigen-specific stimulation of T-cells in immune monitoring, T-cell epitope identification, and development of cellular therapies. We implemented specific parameters for synthesis, purification and analysis of peptide libraries that are important to avoid false positive T-cell responses or toxic inhibition of T-cells and increase shelf-life of peptides.

Specifications

- Tailored peptide libraries
- Different quality grades *(see table)*
- Optimized for cellular assays
- PTMs and labeling available
- Production ISO 9001:2015 certified

Selected References

- *"Conformational Instability Governed by Disulfide Bonds Partitions the Dominant From Subdominant Helper T-cell Responses Specific for HIV-1 Envelope Glycoprotein gp120"*
  Nguyen et al., Vaccine (2015)

- *"Mutant MHC Class II Epitopes Drive Therapeutic Immune Responses to Cancer"*
  Kreiter et al., Nature (2015)

- *"Identification of Immunodominant CD4-Restricted Epitopes Co-Located with Antibody Binding Sites in Individuals Vaccinated with ALVAC-HIV and AIDSVAX B/Edd"*
  Ratto-Kim et al., PLoS One. (2015)

PepTrack™ Peptide Libraries are delivered freeze-dried in multiwell plates or tube racks (micronics).

PepTrack™ Options

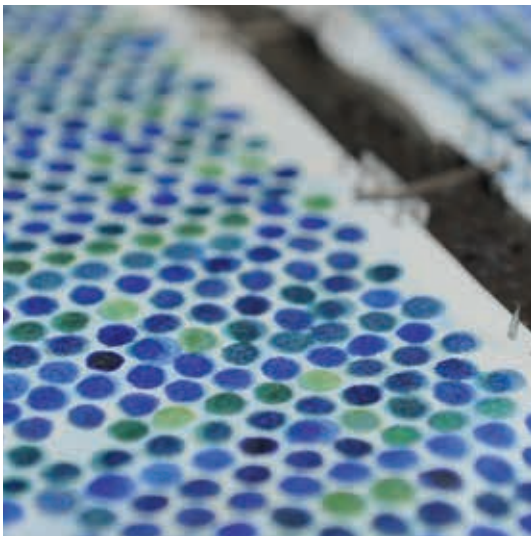
	Purity	QA/QC*	Length **	Scale**	Delivery Format
Fast Track	Unpurified	5 % LC-MS	5 - 15 aa	50 - 100 nmol	Freeze-dried in 96-well plates
Research Track	Unpurified	LC-MS each peptide	7 - 15 aa	1-5 mg	Freeze-dried in 96-tube racks
Research Track Plus	Main product = target peptide	LC-MS each peptide	7 - 15 aa	1-5 mg	Freeze-dried in 96-tube racks
Research Track Plus	> 70 %	LC-MS each peptide	7 - 15 aa	1-5 mg	Freeze-dried in 96-tube racks
Trial Track	> 80 %	LC-MS each peptide	7 - 15 aa	1-5 mg	Freeze-dried in 96-tube racks
Trial Track Plus	> 90 % > 95 % > 97 %	LC-MS each peptide	7 - 15 aa	1-5 mg	Freeze-dried in 96-tube racks

* Please inquire for additional QC
** Please inquire for larger amounts and longer peptides

"For reliable monitoring of tumor and virus specific T-cell responses we have a permanent need for peptides and peptide pools that are produced in a regulated environment for application in a clinical environment. JPT has been a long term and dedicated partner in this regard which continuously works on improving it's peptide based services."

C. Scheibenbogen, Charité Berlin, Berlin, Germany

Below: Automated synthesis of PepSpots™ membranes.



PepMix™ Peptide Pools for T-cell Assays

JPT's PepMixes™ are synthetic peptide pools containing overlapping peptide scans through antigens or selected MHC restricted epitopes. Each peptide is analyzed to meet the requirements of T-cell assays. Peptides are pooled according to our proprietary validated protocol ensuring presence of all peptides in the pool.

Benefits

For reliable and validated T-cell assays such as ELISPOT, appropriate positive and negative controls are essential to confirm proper functionality of the assay and viability of the cells. Compared to commonly used controls like PHA, ConA or full length antigens, synthetic peptide pools offer the advantage of a high batch-to-batch reproducibility, application of reliable chemical and biochemical QC/QA measures, longer stability and extremely efficient immunostimulation.

Applications

Efficient *in vitro* stimulation of antigen-specific CD4+ and CD8+ T-cells

- For optimization and validation of T-cell assays
- For monitoring of cellular immune responses
- For vaccine efficacy testing
- As positive and negative controls
- For T-cell epitope mapping

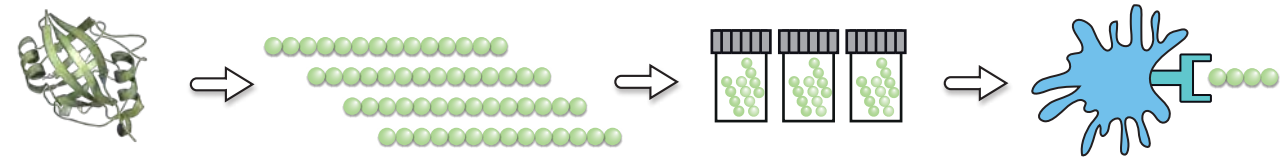
Specifications

- Length/Overlap: 15 / 11 aa (for pooled peptide scans)
- Purity: 70 % to 95 % (LC-MS)
- Amount: 25 tests/vial

Selected References

- *"Metabolic Regulation of Hepatitis B Immunopathology by Myeloid-derived Suppressor Cells"* Pallett et al., Nature Medicine (2015)
- *"The Tuberculosis Vaccine H4: IC31 is Safe and Induces a Persistent Polyfunctional CD4 T cell Response in South African Adults: A Randomized Controlled Trial"* Geldenhuys et al., Vaccine (2015)
- *"Priming with a Simplified Intradermal HIV-1 DNA Vaccine Regimen followed by Boosting with Recombinant HIV-1 MVA Vaccine Is Safe and Immunogenic: A Phase Iia Randomized Clinical Trial"* Munseri et al., PloSOne (2015)
- *"A Phase I Trial Combining Decitabine/dendritic Cell Vaccine Targeting MAGE-A1, MAGE-A3 and NY-ESO-1 for Children with Relapsed or Therapy-Refractory Neuroblastoma and Sarcoma"* Krishnadas et al., Cancer Immunol Immunother. (2015)

Production and use of PepMix™ Peptide Pools. From the antigen primary sequence we create an overlapping peptide scan. The corresponding peptides are synthesized, purified and pooled according to a validated pooling method ensuring presence of all the peptides in the mix. The PepMix™ is then used for T-cell stimulation.



Antigen Sequence ID — *Overlapping Peptide Scan through Antigen Sequences* — *Pooling & Aliquoting* — *Stimulation of T-cells, e.g. for Immune Monitoring or Cell Therapy*

Select Your PepMix™

Cancer

Breast Cancer Burkitt's Lymphoma Gastric Cancer Genital Cancer Glioma Hodgkin's Lymphoma Leukemia Liver Cancer Melanoma Merkel Cell Carcinoma Nasopharyngeal Carcinoma Ovarian Cancer Prostate Cancer Testicular Cancer

Controls

CEF Pool CEF (ext.) Pool CEFT Pool EF Pool HCMV (pp65) HCMV (IE1) HCMV (IE2) Human (Actin) Human (MOG)

Infections

AAV BKV Candida CyCMV EBV F. tularensis HAdV HBV HCMV HEV HHV HHV2 HIV HPV Influenza A L. monocytogenes RLCV RSV VACV VZV YFV Zaire ebola virus Zika virus

Customized PepMix™

We offer fast and low priced production of tailored PepMixes™ from your specific antigen, neo epitopes or peptide library. We help choosing the appropriate peptide purity, specifications and pool layout.

Matrix Pools

Matrix pools offer an efficient way to map epitopes by presenting each peptide in two different pools. Have a look at the figure below! Our customer support team will assist you with the design.

A full up-to-date list can be found on: www.shop.jpt.com

"[...] we utilised the PepMix™ CEF Pool (extended) as well as a custom synthesized PepMix™ spanning the core region of HBV genotype D. [...] Our entire experience with JPT, from ordering/delivery to use in the lab was excellent. [...] JPT will remain our "go-to" company for purchasing peptides."

L. Pallett, Infection and Immunity, University College London, UK

Customized Matrix Pools enable the fast and minimal material consuming identifcation of the epitope(s) within an antigen. Each peptide is present in only two Matrix Pools. In the example shown, 64 peptides are pooled into 16 Matrix Pools. Pools V and XIII elicit a T-cell response. Only peptide 37 is present in both pools and therefore is the peptide containing the epitope.

Pool No.	I	II	III	IV	V	VI	VII	VIII
IX	1	2	3	4	5	6	7	8
X	9	10	11	12	13	14	15	16
XI	17	18	19	20	21	22	23	24
XII	25	26	27	28	29	30	31	32
XIII	33	34	35	36	37	38	39	40
XIV	41	42	43	44	45	46	47	48
XV	49	50	51	52	53	54	55	56
XVI	57	58	59	60	61	62	63	64

Master Pool contains all 64 peptides.
Matrix Pool I contains peptides 1, 9, 17, 25, 33, 41, 49 and 57.
Matrix Pool II contains peptides 2, 10, 18, 26, 34, 42, 50 and 58.
...
Matrix Pool IX contains peptides 1, 2, 3, 4, 5, 6, 7 and 8.
Matrix Pool X contains peptides 9, 10, 11, 12, 13, 14, 15 and 16.

SpikeTides™ Isotope-Labeled Peptides

JPT developed a synthesis technology to enable ultra-fast, highly parallel and inexpensive synthesis of small scale isotopically labeled peptides. They are ideally suited for proteome wide profiling using SRM/MRM proteomic assays. In addition, these peptides can be delivered absolutely quantified in a most reliable and economic way.

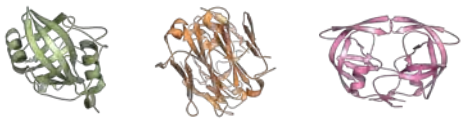
One approach for quantitative analysis of proteins in complex mixtures is the use of tandem mass spectrometry to monitor proteotypic peptides by selected reaction monitoring (SRM) or by parallel analysis of many proteotypic peptides using multiple reaction monitoring (MRM). For absolute quantitation, stable isotope-labeled proteotypic peptides are used as internal standards. These standards usually need to be purified to enable subsequent peptide content determination. This results in prices of several hundred US$ / € per peptide. JPT overcomes this situation by attaching a small chemical tag (Quanti-Tag) to the proteotypic peptide which allows our specialists cost efficient quantitation of the proteotypic peptide. When you digest your sample, spiked with the appropriate SpikeTides™, the protease will cleave the peptide-tag bond, releasing the desired proteotypic peptide for your measurements.

Selected References

- *"Needles in the Blue Sea: Sub-Species Specificity in Targeted Protein Biomarker Analyses Within the Vast Oceanic Microbial Metaproteome"*
  Saito et al., Proteomics (2015)
- *"Targeted Proteomics of Human Metapneumovirus in Clinical Samples and Viral Cultures"*
  Foster et al., Analytical Chemistry (2015)
- *"Biomarker Development for Intraductal Papillary Mucinous Neoplasms Using Multiple Reaction Monitoring Mass Spectrometry"*
  Kim et al., J. Proteome Res (2015)
- *"Prediction of Colorectal Cancer Diagnosis Based on Circulating Plasma Proteins"*
  Surinova et al., EMBO Mol Med. (2015)

Quantification of Proteins with JPT's Proteomics Tools.

Proteins of interest or whole cell proteome



Tryptic digestion

Proteotypic peptides

SpikeMix™ Peptide Pools
- Customized or off-the shelf
- Stable isotope-labeled
- PTMs & alkylation
- Inexpensive & fast
- e.g. TAAs, cytokines and more

A) Shotgun experiments or B) SRM/MRM assay setup

Identification and relative quantification of proteins

SpikeTides™ Peptides
- Customized
- Stable isotope-labeled or light
- PTMs & alkylation
- Inexpensive & fast

SRM/MRM assay with absolutely quantified reference peptide(s)

Absolute quantification of proteins of interest

Quantified SpikeTides™_TQL
- Customized or off-the-shelf
- Stable isotope-labeled
- Absolute quantification
- PTMs & alkylation
- Inexpensive & fast

SpikeTides™ Options

SpikeTides™ – light

- Small scale, unpurified, unlabeled proteotypic peptides with C-terminal Arg or Lys for optimization and validation of multiplexed SRM assays
- Delivery format: Freeze dried in 96-well plates

SpikeTides™_L – heavy

- Isotopically labeled, small scale, unpurified proteotypic peptides with C-terminal heavy Arg or Lys for development of SRM assays and relative quantitation of proteins using a single product
- Delivery format: Freeze dried in 96-well plates

SpikeTides™_TQ – light and quantified

- Quantified, small scale, unlabeled proteotypic peptides. Each peptide carries a Quanti-Tag that will be cleaved by trypsin digestion
- Delivery format: Freeze dried in 96-tube racks (5 aliquots per peptide)

SpikeTides™_TQL – heavy and quantified

- Quantified and heavily labeled, small scale, proteotypic peptides. Each peptide carries a Quanti-Tag that will be cleaved by trypsin digestion
- Delivery format: Freeze dried in 96-tube racks (5 aliquots per peptide)

"My group studies the proteomic composition of distinct chromatin domains, the mechanisms that operate to maintain the composition of histone modifications and the associated proteins. For precise and accurate identification and quantification of histone peptides that carry multiple post-translational modifications directly from biological samples JPT's SpikeTides™_TQL peptide standards proved to be of excellent value for our research in various projects."

A. Imhof, Adolf-Butenandt Institute, University of Munich, Germany

	Purity*	QA / QC	Scale*	Delivery	Delivery Format
SpikeTides™ – light	Unpurified	5 % LC-MS	50 nmol	3 weeks	Freeze-dried in 96- or 384-well plates
SpikeTides™_L – heavy	Unpurified	5 % LC-MS	10 nmol	3 weeks	Freeze-dried in 96- or 384-well plates
SpikeTides™_TQ – light and quantified	Unpurified/ Purified	100 % LC-MS	5 x 1 nmol (target peptide)	5 weeks	Freeze-dried in 96-tube racks
SpikeTides™_TQL – heavy and quantified	Unpurified/ Purified	100 % LC-MS	5 x 1 nmol (target peptide)	5 weeks	Freeze-dried in 96-tube racks
Maxi SpikeTides™_QL_ AAA	> 95 %	100 % LC-MS & AAA	10 x 1nmol (target peptide)	5 weeks	Freeze-dried in 96-tube racks

* Please inquire for higher purity or larger amounts

SpikeMix™ Peptide Pools & Sets

Our inexpensive stable isotope-labeled peptide pools and sets for use in mass spectrometry-based proteomics feature large numbers of heavy peptides, e.g., for cytokines, peptide hormones and tumor associated antigens. All heavy peptides are stable isotope-labeled using heavy arginine (U-13C6; U-15N4) or lysine (U-13C6; U-15N2).

Applications

- Biomarker discovery and validation
- Mass spectrometry based assays (SISCAPA, MRM, etc.)
- Quantitation of immunomodulaters
- Standardization of mass spectrometry-based proteomics assays

Benefits

- Quantitation of multiple protein targets from a single sample
- Lowest prices for SIL peptides and quantified peptides
- Multiplexed analysis of disease status and therapeutic success

Selected References

- *"Quantitative Proteomics of Bronchoalveolar Lavage Fluid in Idiopathic Pulmonary Fibrosis"* Foster et al., J of Proteome Research (2015)
- *"Quantitative Variability of 342 Plasma Proteins in a Human Twin Population"* Liu et al., Mol Syst Biol. (2015)
- *"High Density and Ligand Affinity Confer Ultrasensitive Signal Detection by a Guanylyl Cyclase Chemoreceptor"* Pichlo et al., J Cell Biol. (2014)

Select your SpikeMix™ & SpikeTides™ Set

Absolutely Quantified

Histone H3
Metabolic Enzymes

Customized

JPT offers stable isotope-labeled peptides tailored to your specifications. Alkylation and post-translational modifications are available as well as absolute quantitation.

Non-Quantified

ABRF (cross-species standard)
CEF (ext.) Cytokines (human)
Cytokines (12 further species)
Kinase Activation Loops
Peptide Hormones
Tumor Associated Antigens
Wnt Signaling Pathway

A full up-to-date list can be found on: www.shop.jpt.com

"As Director of the Protein Profiling at Yale Keck Biotechnology Resource Facility, I coordinated a collaboration between the Association of Biomolecular Resource Facilities (ABRF) standard proteomic research group (sPRG) and JPT Peptide Technologies to develop the ABRF cross-species SpikeMix™ Peptide Pool. The joint development turned out to be an extraordinarily effective endeavor and the resulting product was qualified in more than 52 proteomics labs around the globe. I was impressed by JPT's scientific and technological capabilities as well as their enthusiasm to drive the project forward."

C. M. Colangelo, Protein Profiling at Keck Biotechnology Resource Facility, Yale University, USA

BioTides™ Small Scale Biotinylated Peptides

BioTides™ are designed for your binding assays using streptavidin coated beads, membranes, glass slides or ELISA plates. BioTides™ are synthesized by JPT's high-throughput synthesis method SPOT and represent the most economic source of biotinylated peptides.

Applications

- Identification and optimization of kinase-, phosphatase-, acetyltransferase- and histone deacetylase-substrates via standard screening systems (AlphaScreen, FlashPlates, SPA-Beads etc.)
- Mapping of protein/protein interaction sites (ELISA-like assays, precipitation of interacting proteins)
- Production of peptide microarrays
- Loading of columns for affinity chromatography

Benefits

- Highly parallel synthesis approach
- Turnaround: > 10 000 peptides/week
- Ready-to-use freeze dried peptides in 96-well microtiter plates
- Low cost source for small scale biotinylated peptides

Product Specifications

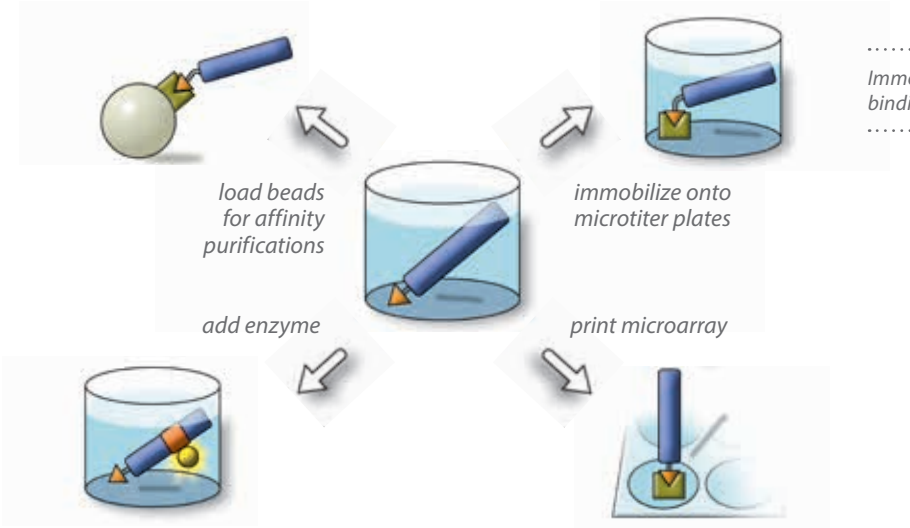
- Amount of 50-200 nmol per peptide
- Peptide length: 6-20mers
- N-terminally biotinylated via a hydrophilic flexible linker, ensuring proper presentation of peptides
- Unpurified but capped after each synthesis step for removal of deletion and truncation sequences during re-immobilization to streptavidine matrices
- Incorporation of non-standard amino acids and other modifications possible

Selected References

"Epitope Mapping via Selection of anti-FVIII antibody-Specific Phage-presented Peptide Ligands That Mimic the Antibody Binding Sites"
Kahle et al., Thromb Haemost (2015)

"Evaluation of Viral Peptide Targeting to Porcine Sialoadhesin Using a Porcine Reproductive and Respiratory Syndrome Virus Vaccination-Challenge Model"
Ooms et al., Virus Research (2013)

"Human IgE Against the Major Allergen Bet v 1 – Defining an Epitope with Limited Cross-Reactivity Between Different PR-10 Family Protein"
Levin et al., Clinical & Experimental Allergy (2013)



Immobilization of BioTides™ for binding assays.

Peptide Arrays & Peptide ELISA

JPT uses its proprietary PepStar™, SPOTS™ and Peptide ELISA technologies for the validated production of peptide arrays, microarrays and ELISA. Peptides are immobilized onto surfaces such as cellulose membranes or glass slides. They can represent proteins or a whole proteome as well as specific peptide sequences. Each microarray batch passes rigorous quality control ensuring high batch-to-batch reproducibility.

Benefits of Peptide Arrays

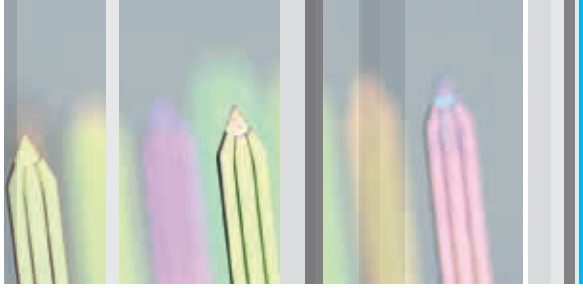
- Chemoselective and directed immobilization leads to proper presentation of binding sites
- Synthetic peptides have high-batch-to-batch reproducibility
- Post-translational modifications or other modifications possible

"[...] To map the epitopes of our newly generated specific anti-rat TAAR1 antibodies we used JPT's PepStar™ Peptide Microarrays. The peptide microarrays greatly contributed to our successful and recently published study. We were very satisified with the exceptional product and service delivered by JPT Peptide Technologies as well as their scientific Customer Support which was always at our disposal."

S. Obermüller, F.Hoffmann – La Roche Ltd., Roche Pharma Research and Early Development, Basel, Switzerland

JPT's Array Platform	Peptide Origin	Assay Type
PepStar™ or RepliTope™	Overlapping peptide libraries, epitope collections, substitution or truncation libraries, alanine scans	Immune Monitoring , Seromarker Discovery, Antibody Signature Profiling, Epitope Mapping & Optimization
PepSpots™	Overlapping peptide scans through antigens, alanine-scans, substitutional or truncation analyses of identified epitopes	Epitope Mapping, Validation and Optimization
PepStar™ ULTRA	ULTRA peptide libraires with high coverage of sequence diversity, e.g. for HIV, cancer	Seromarker Discovery/Immune Monitoring of targets with sequence diversity
PepStar™ Multiwell Microarray	Selected Peptides from antigens	Selective Antigen Profiling
Peptide ELISA	Selected Peptides	Immune Profiling, Protein-Protein Interaction Studies
Enzyme Substrate Microarrays	Peptide substrates derived from annotated substrate proteins	Enzyme Profiling
Histone Code Peptide Microarray	Huge library of histone peptides with all potential post-translational modifications	Protein-Histone Interaction Studies

Selection of JPT's array platforms and their applications.



Microarray & ELISA Assay Service

JPT offers comprehensive incubation and analysis services using its peptide microarray platforms PepStar™ and RepliTope™ or Peptide ELISA. Save time for assay set-up and optimization and take advantage of our experience in data evaluation.

Applications

- Seromarker Profiling
- Receptor-ligand interaction studies
- Antibody epitope mapping
- Mimotope identification and optimization
- Enzyme substrate identification and optimization

Benefits

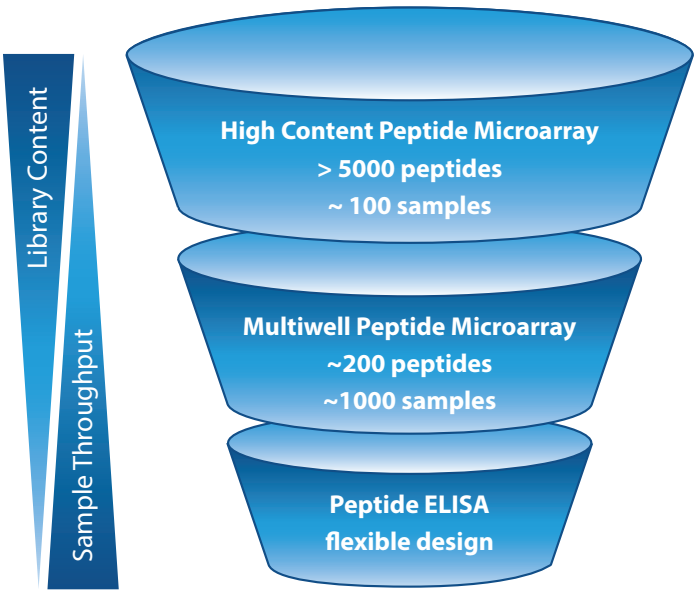
- Our proprietary peptide microarray platforms
- Well established and automated assay procedures
- Sample handling and profiling regulated by DIN ISO 9001:2015 and GCLP
- Strong bioinformatic support for array design and data interpretation

Send us a short outline of your project and we will:

- Suggest the appropriate array platform to be used
- Provide bioinformatic support for peptide and microarray design
- Provide project proposal and quotation
- Synthesize peptides and generate peptide microarrays
- Incubate microarrays with your sample and perform control experiments
- Evaluate and interpret data
- Provide comprehensive and confidential report

“[...] JPT's PepStar™ Peptide Microarray platform as well as its full profiling service and data interpretation capabilities have been a reliable and robust approach to elucidate the molecular details of these protein-protein interactions.”

J. Schultz, Carolus Therapeutics, Inc., San Diego, USA



Large numbers of peptides tested using high content peptide microarrays.

Hits are confirmed by selective tests with thousands of samples applying multiwell peptide microarrays.

Validation by flexible and robust Peptide ELISA. Results can be transferred towards diagnostic assays.

PepStar™ Customized Peptide Microarrays

With our PepStar™ Peptide Microarray platform we produce microarrays that combine several advantages over other microarrays. We utilize chemoselective coupling to generate microarrays displaying directed and covalently attached peptides that are purified in the process. Multiple copies of each peptide microarray are prepared with flexible layouts at unmatched economy.

Applications

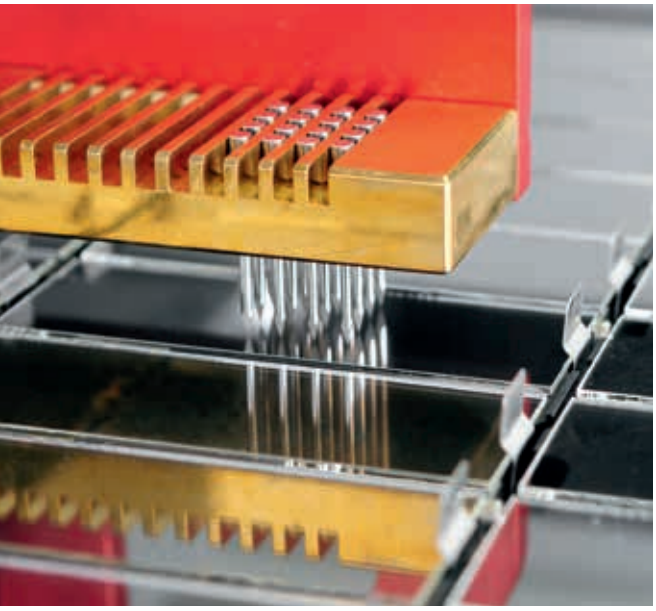
- Incubation with proteins, patient samples, cell lysates, enzymes
- Epitope mapping and optimization
- Antibody signature profiling
- Seromarker profiling
- Immune monitoring
- Protein-protein interactions

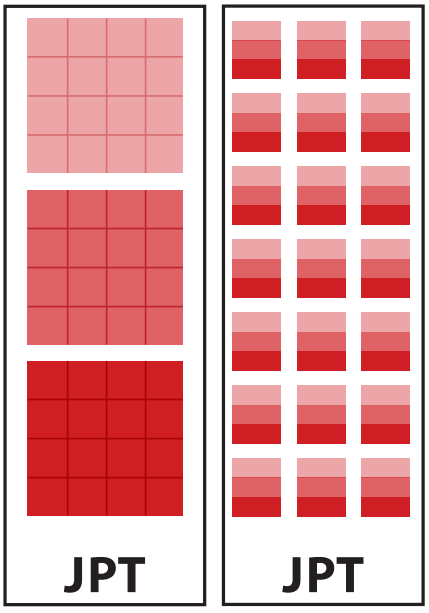
Benefits

- Patented synthesis of peptides warrants high batch-to-batch reproducibility
- Directed and chemoselective immobilization ensures availability of binding sites
- Provision of thousands of identical microarrays
- Low consumption of patient materials and proteins
- High shelf stability
- High assay sensitivity

Selected References

- *"Traceamine-associated Receptor1 Activation Silences GSK3β Signaling of TAAR1 and D2R Heteromers"* Harmeier et al., European Neuropsychopharmacology (2015)
- *"High-Throughput Microarray Incubations Using Multi-Well Chambers"* Zerweck et al., Methods Mol Biol. (2015)
- *"Protective Efficacy of Adenovirus-protein Vaccines Against SIV Challenges in Rhesus Monkeys"* Barouch et al., Science (2015)
- *"Relationships Between T Cell and IgE/IgG4 Epitopes of the Anisakis Simplex Major Allergen Ani s 1"* Alonso et al., Clin Exp Allergy. (2015)





The PepStar™ Microarray layout depends on the number of peptides and can be adjusted to your needs.

Left: High density microarray with 3 subarrays.
Right: Multiwell Microarray with 21 subarrays (3 copies each) that can be incubated separatedly with different samples using a multiwell array chamber.

RepliTope™ Catalog Peptide Microarrays

RepliTopes™ combine all the advantages of PepStar™ Microarrays with the availability of a catalog product. We selected many common antigens from infectious pathogens and cancer types. The RepliTope™ Antigen Collections are high density peptide microarrays displaying large collections of antigens from, or even the whole proteome of a particular virus or bacterium.

Applications

- Antibody epitope mapping and optimization
- Antibody signature profiling
- Seromarker discovery
- Immune monitoring
- Protein-protein interactions

Benefits

- Premade microarrays available within days
- RepliTopes™ display peptide scans through antigens or whole proteomes
- Each peptide is presented 2-4 times on each microarray to ensure reproducibility of results
- Economical access to many identical peptide microarrays

Selected References

"Antibodies to Influenza Nucleoprotein Cross-react with Human Hypocretin Receptor 2"
Ahmed et al., Science Translational Medicine (2015)

"Serum Reactome Induced by Bordetella Pertussis Infection and Pertussis Vaccines: Qualitative Differences in Serum Antibody Recognition Patterns Revealed by Peptide Microarray Analysis"
Valentini et al., BMC Immunol. (2015)

"H1N1 Viral Proteome Peptide Microarray Predicts Individuals at Risk for H1N1 Infection and Segregates Infection Versus Pandemrix® -Vaccination"
Aditya et al., Immunology (2015)

Selection of available RepliTopes™

Tumor Associated Antigens	Infectious Diseases	Antigen Collections
Breast/Prostate • Mammaglobin A • NY-ESO-1 • PSA ...	Adenovirus • Hexon and penton proteins	HIV ULTRA • Gag p17 and p24, tat, nef and env, immunogenic regions for frequent clades (A,B,C,D,G, CRF1,CRF2). Coverage for ENV 57%, GAG 72%, NEF 62% and TAT 46%.
Epithelia • CEA • Claudin-6 ...	BKV • Capsid proteins (VP1, VP2, VP3) • Large and small T antigens	HBV ULTRA • Covers 255 proteins of 53 annotated proteomes of HBV. Non-redundant sequences from genes P, S, X, C for 14 genotypes A1, A2, A3, B, B/C, B1, B2, C, D, E, F1, F2, G and H.
Melanoma • MAGEA1, A3 and A4 • Melan-A/MART-1 • Prame/OIP4 ...	EBV • EBNA (1, 2, 3a, 3b, 3c, LP) • LMP1 and LMP2 ...	M. tuberculosis ULTRA • 40 antigens of MTB reference strain H37Rv supplemented by 354 homologous antigens found in other M. tuberculosis strains. 17 different MTB strains are represented by 6388 peptides.
Vaccinia virus • MVA018L (Host range p. 2) • MVA093L (p53) ...	HCMVA • IE-1, IE-2, pp65, • UL28, UL32, UL40 ...	
Wilms tumor1 • WT33	Influenza A • HA, MP1 and NC from different strains	
Miscellaneous • Cyclin B1 • Histone H1.2 and H4 • P53_human ...	RSV • Protein F, NC protein N	
	Miscellaneous • HBV (Large envelope protein) • HHV6 (U54) • Yellow fever (NS24B) ...	

A full up-to-date list can be found on: www.shop.jpt.com

PepSpots™ Peptide Arrays on Membranes

PepSpots™ peptides are synthesized directly on cellulose membranes by SPOT technology. The resulting PepSpots™ Peptide Arrays combine a reliable assay, easy experimental procedure (like ELISA), inexpensive equipment needs and a highly flexible array. Different array format are possible as well as post-translational and other peptide modifications. PepSpots™ are the method of choice for fast and reliable antibody epitope mapping.

Applications

- Antibody epitope mapping
- Functional characterization of mapped epitopes
- Optimization of epitopes
- Characterization of protein-protein contact sites

Benefits

- Peptides attached via a flexible linker
- Membrane for direct use
- Readout via chemiluminescence
- Hydrophilic cellulose membranes minimize unspecific interactions
- Detection of low affinity interactions
- Easy standard protocols

Selected References

- *"Differential and Concordant Roles for PARP1 and Poly (ADP-ribose) in Regulating WRN and RECQL5 Activities"*
  Khadka et al., Mol Cell Biol. (2015)
- *"Itch WW Domains Inhibit its E3 Ubiquitin Ligase Activity by Blocking E2-E3 Transthiolation"*
  Riling et al., J Biol Chem. (2015)
- *"Structural Differences of Amyloid-β fibrils Revealed by Antibodies From Phage Display"*
  Droste et al., BMC Biotechnol. (2015)

"[...] we are collaborating with JPT for many years and are very satisfied with the relationship which led to several well received publications. Especially, their unique array technology PepSpots™ helped us to enhance our knowledge [...]."

J. Schymkowitz, Vrije Universiteit Brussel, Belgium

Left: Your PepSpots™ package includes: PepSpots™ membrane, data CD and application protocol.

Right: Customized Peptide ELISA plates are available in different formats for various applications.

Peptide ELISA

Peptide ELISA (Enzyme-linked immunosorbent assay) enables analysis and screening on amino acid sequence level. For example, mapping of epitopes or definition of protein interaction sites, thus providing much more information than conventional ELISA.
We offer custom peptide ELISA plates with optional incubation and assay service and an off-the-shelf Histone Peptide ELISA for screening of PTM-specific antibodies or enzymes.

Peptide ELISA specifications

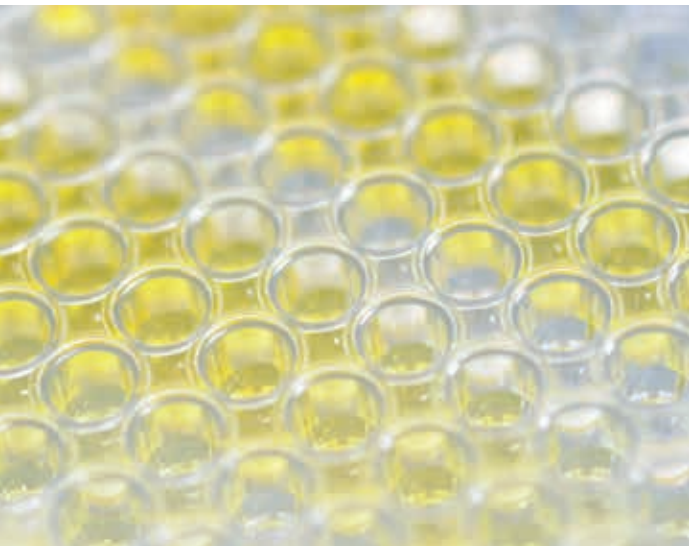
- Discovery Grade:
  Unpurified peptides but truncated sequences are removed during immobilization
- Validation Grade:
  Custom Peptides with full HPLC-MS analysis and guaranteed purity

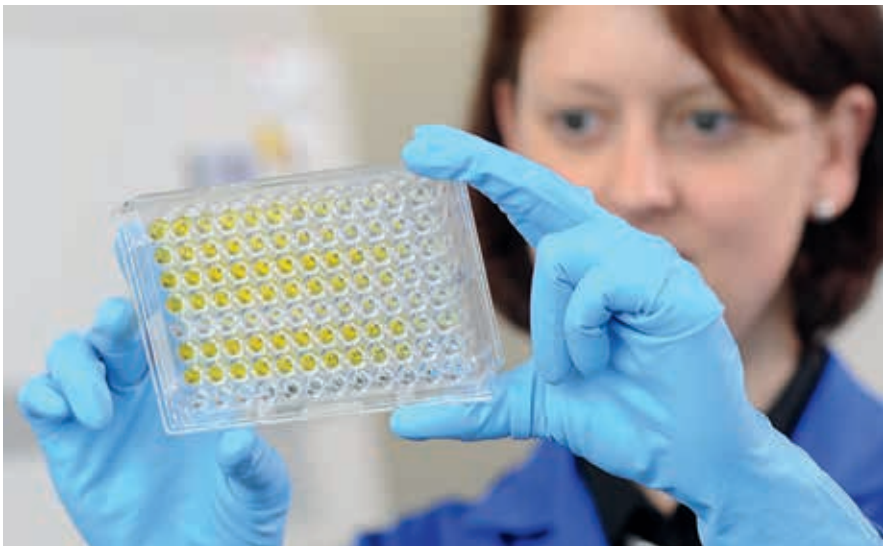
Applications for Peptide ELISA

- Antibody epitope mapping
- Immune profiling
- Determination of antibody titers
- Analysis of protein-protein interactions
- Analysis of enzymatic reactions
- Validation of microarray results

Selected References

- *"Patients with Early Inflammatory Arthritis Who are Anti-CCP Antibody Positive have Antibodies Against Acetylated and Carbamylated Vimentin Peptides"*
  Juarez et al., Rheumatology (2015)
- *"Restrictive IgG Antibody Response Against Mutated Citrullinated Vimentin Predicts Response to Rituximab in Patients with Rheumatoid Arthritis"*
  Lindenberg et al., Arthritis Research & Therapy (2015)
- *"Evaluating the Efficacy of Aluminium Phosphate Formulated L2 Based HPV Vaccine"*
  Lakshmikanth et al., Asian Journal of Pharmaceutical and Clinical Research (2015)
- *"Identification of Novel Antiacetylated Vimentin Antibodies in Patients with Early Inflammatory Arthritis"*
  Juarez et al., Ann Rheum Dis (2015)





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