PEPTIDOMICS

Peptidomics involves the comprehensive study of the peptidome, which encompasses all peptides present in a biological sample. The primary analytical techniques utilized in peptidomics are liquid chromatography (LC) combined with mass spectrometry (MS). Unlike traditional methods requiring prior knowledge of biological activity, MS allows for the analysis of all endogenous small peptides, circumventing the need for bioassays or protein precursor sequence predictions.

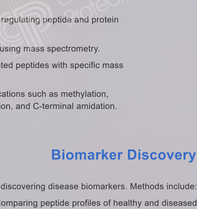
Peptidomics shares technological similarities with proteomics but requires tailored workflows to accommodate the unique physicochemical properties of peptides, such as molecular sizes ranging from 0.5 to 10 kDa. These sizes are intermediate between typical proteins and small molecules, which historically led to peptides being overlooked in proteomic or metabolomic analyses.

Peptidomics in Creative Proteomics

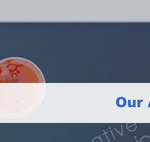
Peptide Profiling

Peptide profiling is a core technique in peptidomics, aimed at identifying and quantifying all peptides present in a biological sample. The process includes:

- Sample Preparation: Extracting peptides from tissues, blood, saliva, or other biological materials.
- Peptide Separation: Separating peptides using techniques such as high-performance liquid chromatography (HPLC) or ultrafiltration.
- Mass Spectrometry Analysis: Analyzing peptides using mass spectrometry (e.g., electrospray ionization mass spectrometry (ESI-MS) or matrix-assisted laser desorption/ionization mass spectrometry (MALDI-MS)) to determine their mass-to-charge ratio.
- Data Analysis: Utilizing bioinformatics tools to analyze data, identifying and quantifying peptides in the sample.



Peptide Identification and Quantification



Accurate identification and quantification of peptides are crucial in peptidomics research. Key techniques include:

- Tandem Mass Spectrometry (MS/MS): Further fragmenting peptide molecules to obtain their amino acid sequence information.

Post-Translational Modification (PTM) Analysis

Post-translational modifications (PTMs) play a key role in regulating peptide and protein functions. Common PTM analyses include:

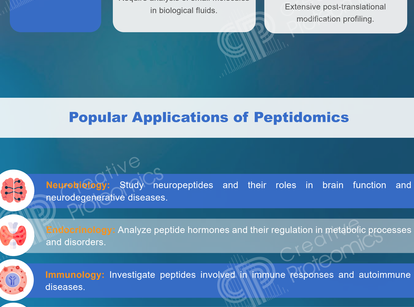
- Phosphorylation: Analyzing phosphorylated peptides using mass spectrometry.
- Glycosylation: Detecting and characterizing glycosylated peptides with specific mass spectrometry methods.
- Other Modifications: Identifying and analyzing modifications such as methylation, acetylation, disulfide bonds, N-terminal pyroglutamylation, and C-terminal amidation.

Biomarker Discovery

Peptidomics is vital in discovering disease biomarkers. Methods include:

- Comparative Analysis: Comparing peptide profiles of healthy and diseased samples to identify disease-specific peptides.
- Validation: Validating candidate biomarkers with independent sample sets and multiple techniques (e.g., ELISA or Western Blot).

Our Advanced Platform



Peptidomics vs. Proteomics

	Peptidomics	Proteomics
Definition	The study of peptides, which are short chains of amino acids typically less than 50 residues long.	The study of the entire set of proteins produced or modified by an organism.
Focus	Identifying and quantifying endogenous peptides, including their sequences and modifications.	Large-scale study of proteins, including their expression, functions, and modifications.
Unique Characteristics	Peptides maintain secondary structure elements enabling specific interactions and dynamic conformations.	Proteins exhibit stable but inactive isoforms upon denaturation.
Post-Translational Modifications (PTMs)	Focuses on specific PTMs like phosphorylation, glycosylation, pyroglutamylation, and amidation.	Focuses on specific PTMs like phosphorylation, glycosylation, disulfide bonds, pyroglutamylation, and amidation.
Quantification Methods	Label-free quantification, peak intensity comparison across LC-MS runs.	Label-free quantification, spectral counting, intensity-based methods, and targeted quantification like SRM/MRM.
How to Choose	Interested in endogenous peptides and peptide hormones. Focus on peptide-specific post-translational modifications. Require analysis of small molecules in biological fluids.	Study the entire protein complement of a cell, tissue, or organism. Investigate protein-protein interactions or complex protein networks. Extensive post-translational modification profiling.

Popular Applications of Peptidomics

- **Neurobiology:** Study neuropeptides and their roles in brain function and neurodegenerative diseases.
- **Endocrinology:** Analyze peptide hormones and their regulation in metabolic processes and disorders.
- **Immunology:** Investigate peptides involved in immune responses and autoimmune diseases.
- **Microbiology:** Discover antimicrobial peptides and develop peptide-based pathogen detection assays.
- **Cancer Research:** Study peptides in the tumor microenvironment and develop peptide-based cancer vaccines.
- **Agriculture and Food Science:** Analyze plant defense peptides and bioactive peptides in food.
- **Gastroenterology:** Investigate gut peptides and their roles in digestive and inflammatory bowel diseases.

Contact Us

Creative Proteomics