

AT A GLANCE

Small molecules vs. peptides

The chart below shows some of the key differences at a glance.

	Small molecules	Peptides
Structure	Synthetic organic compounds built from varied chemical rings and functional groups	Chains made strictly of amino acids joined by peptide bonds
Size	Under 900 Da	Usually about 1,000 to 5,000 Da
Cell entry	Often high; many pass through cell membranes to reach targets inside the cell	Usually low; mostly act on targets on the cell surface
Delivery	Often stable enough to take orally as a pill	Broken down by digestion; usually injected, nasal or topical
Specificity	Bind small pockets on a target; higher potential for off-target effects	Large binding surface; very precise binding to target receptors
Stability	Generally stable; long shelf life, slower breakdown in the body	Fragile; broken down quickly by enzymes in the blood



Independent testing for peptides & small molecules

We're a contract analytical lab in Cleveland, Ohio. Send us a sealed vial and we'll tell you what's in it, how much is there, and how clean it is.

WHAT WE TEST

- Identity by LC-MS (intact mass)
- Quantity by HPLC-UV against a reference standard
- Purity by HPLC-UV (% peak area)
- Multi-component blends and GLP-class peptides
- Endotoxin testing (LAL) add-on

COLLECT THE SERIES

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TECHNICAL BULLETIN • VOL. 1 • NO. 1

What Are Peptides?

Peptides, small molecules, and how a lab checks what's really in the vial.



THE BASICS

What are peptides?

Peptides are in the news for performance, sleep, weight loss, anxiety, skin health and more. So what exactly is a peptide, and why have they captured the world's attention?

Peptides are short chains of amino acids, the fundamental building blocks of proteins. In the body, amino acids link together through chemical bonds called **peptide bonds**.

When a chain contains roughly 2 to 50 amino acids, it's classified as a peptide. When the chain grows longer (typically 50+ amino acids) and folds into a complex 3D structure, it's classified as a protein (collagen, for example).

Many peptides act as cellular messengers. They signal specific receptors in the body to perform precise tasks, such as releasing growth hormone, stimulating skin repair, reducing inflammation, or triggering metabolic processes.

What's a small research molecule?

A small research molecule is a low-molecular-weight organic compound, typically under 900 daltons (Da), designed or used in the lab to interact with specific biological targets like enzymes, receptors or ion channels.

In drug discovery, "research molecule" usually means the chemical is being studied to understand biological pathways. Familiar small molecules include everyday drugs like aspirin, ibuprofen and caffeine.

CHECKING THE LABEL

Testing peptides

As research interest in peptides and small molecules has exploded, so has attention on the accuracy of how they're formulated and labeled. Researchers want to know: **does the vial match its label claim?**

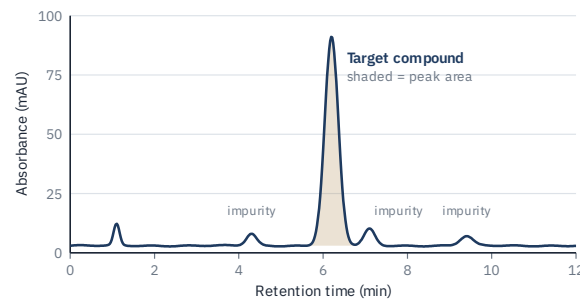
If a lyophilized (freeze-dried) vial is labeled BPC-157, 10 mg, is that accurate? How would you know?

Analytical labs like Erie Coast Analytical use high performance liquid chromatography (**HPLC**) and mass spectrometry (**MS**) to test those label claims.

STEP 1 • SEPARATE

HPLC and the chromatogram

An HPLC system takes in a sample, separates the target compound from its impurities, and produces a graph called a **chromatogram** that shows each separated component and how much of it is present.



Example chromatogram: one main peak and three small impurity peaks.

The X-axis is **retention time**: how long each component takes to travel through the HPLC column and reach the detector.

The Y-axis is **signal intensity**: the detector's response (e.g., UV light absorbance) to the target compound and any impurities.

Each peak is one separated component. A peak's position (retention time) helps indicate what the substance is, and its area tells you how much of it is in the sample.

STEP 2 • CONFIRM

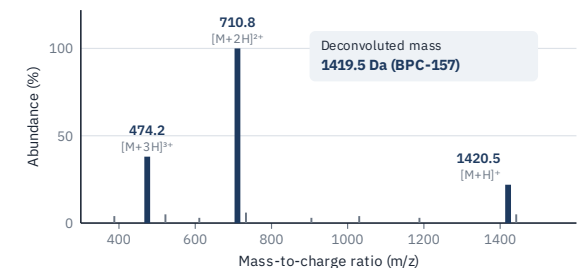
Mass spectrometry

If HPLC gives a peak for the substance, why not stop there? Retention time alone can't prove identity, and an HPLC detector can't tell if a different compound came out at the same time (called **co-elution**). So a mass spectrometer is paired with the HPLC (LC-MS). The HPLC tells you how long a compound took to travel through the column; the mass spectrometer measures its mass to reveal what it actually is.

In LC-MS, the liquid leaving the HPLC is sprayed through a charged needle (**electrospray ionization**) into a fine mist. As the solvent evaporates, the molecules are left carrying an electric charge as gas-phase ions.

Electric fields guide the ions into a **mass analyzer**, which sorts them by their mass-to-charge ratio (m/z). A detector counts the ions arriving at each m/z , recording their abundance.

READING THE MASS SPECTRUM



Example spectrum: BPC-157 picks up 1, 2 or 3 charges, giving 3 peaks from 1 molecule.

The output is a **mass spectrum**: ion abundance (Y) plotted against m/z (X). Software converts the peaks back into the molecule's mass. When it matches the expected mass, identity is confirmed with high confidence.