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Specializes in R&D and manufacturing of peptide synthesis equipment, providing comprehensive technical solutions and services.

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GLP-1: More Than Just Weight Loss—A Biotech Revolution

In today's health and medical landscape, one name stands out above the rest—GLP-1. From specialized diabetes medications to the wildly popular “weight-loss injections,” it is revolutionizing countless lives and reshaping the pharmaceutical industry. Today, let's lift the veil on the mystery of GLP-1.

I. What is GLP-1? Our body's “smart blood sugar manager”

GLP-1 (Glucagon-like peptide-1) is a hormone naturally secreted by the human intestine. You can think of it as an intelligent, all-purpose body steward that begins working after we eat:

1. Precision Blood Sugar Control: It instructs the pancreas to secrete insulin, thereby lowering blood glucose levels. Crucially, it only activates when blood sugar is elevated and remains inactive when levels are normal, thus rarely triggering hypoglycemia and offering exceptional safety.
2. Suppress appetite: It signals to the brain that you're full, slows stomach emptying, and increases feelings of fullness, naturally reducing food intake.
3. Multi-action support: It inhibits the secretion of glucagon and acts on the appetite center in the hypothalamus to generate satiety signals, thereby reducing food intake.

It is precisely this remarkable “one-stone-kills-multiple-birds” mechanism that makes GLP-1 an ideal therapeutic target for treating type 2 diabetes and obesity.

II. From “Fleeting” to “Everlasting”: The Miracle of Technology

However, the natural GLP-1 has an extremely short half-life (only 1-2 minutes) because it is rapidly degraded by the body's dipeptidyl peptidase-4 (DPP-4) and quickly cleared by the kidneys. Like a fleeting moment, it cannot serve as an effective drug.

The brilliance of scientists shines through here—through biotechnology, two major classes of drugs have been developed, such as liraglutide, semaglutide, and sitagliptin. These well-known star drugs are the very crystallization of this technological breakthrough.

1. GLP-1 receptor agonists: These are not naturally occurring GLP-1 molecules but rather analogues. Through molecular modification, they are engineered to resist degradation by DPP-4, thereby prolonging their duration of action. These are commonly referred to as “GLP-1 drugs,” such as liraglutide, semaglutide, dulaglutide, and others.
2. DPP-4 Inhibitors: These drugs (such as sitagliptin) inhibit the DPP-4 enzyme, thereby slowing the degradation of endogenous GLP-1 in the body and increasing its levels.

III. Synthetic Process: The Art of “Life Manufacturing” Worth Billions

The synthesis of GLP-1 peptides and their analogues is a highly complex technical endeavor, currently relying primarily on two major technical approaches: chemical synthesis and biosynthesis.

Route 1: Chemical Synthesis Method

Solid-phase peptide synthesis (SPPS) is the mainstream method for research and small-to-

medium-scale production used to synthesize GLP-1 analogs, particularly variants containing non-natural amino acids or special chemical modifications.

Route 2: Biosynthetic Approach (Recombinant DNA Technology)

This is the mainstream method currently used for the commercial production of most GLP-1 receptor agonists (such as liraglutide and semaglutide). The fundamental principle involves inserting the gene sequence encoding the GLP-1 analog into an expression vector, which is then transferred into a host cell (such as *Escherichia coli*, yeast, or Chinese hamster ovary cells, CHO). The host cell's protein synthesis system is then utilized to produce the target peptide.

Summary and Comparison

Method	Solid-Phase Peptide Synthesis (SPPS)	Biosynthetic Method (Recombinant DNA)
Principle	Stepwise chemical coupling	Cell Factory Biosynthesis
Main Products	GLP-1 analogues (especially those containing non-natural amino acids)	GLP-1 analogues (long-chain, complex modifications)
scale	Small and medium-sized	Mass industrial production
Cost	High (amino acid, solvent costs)	Low (High initial investment, low after scaling)
Flexibility	High, easy to introduce modifiers	relatively low
Technical Barrier	Organic Chemistry, Purification Techniques	Molecular Biology, Fermentation Engineering, Protein Purification
Commercial Applications	Early-stage drugs, small-scale peptides	Mainstream methods (liraglutide, semaglutide, etc.)
Strategic Positioning	Fast and flexible for innovation and iteration	Achieve economies of scale to reduce costs and ensure global supply

Currently, GLP-1 receptor agonists on the market are primarily produced commercially via biosynthetic methods due to their significant scale and cost advantages. Chemical synthesis, however, plays an irreplaceable role in early drug discovery, structure-activity relationship studies, and the production of specially modified short peptides.

IV. The Strategic Significance of the GLP-1 Track

1. Market Size and Growth Potential

Diabetes and obesity are global public health issues, with a large and continuously growing patient population, constituting a vast market worth hundreds of billions of dollars.

2. Market education has been largely completed:

Leading players (such as Novo Nordisk and Eli Lilly) have invested heavily in market education, resulting in unprecedented consumer awareness and acceptance of GLP-1. This has significantly reduced the market introduction costs for subsequent products.

3. Strong pricing power and commercial barriers:

Innovative drugs, particularly GLP-1 medications with significant clinical advantages, enjoy patent protection, command high prices, and offer substantial profit margins. The barriers to research, development, production, and regulatory approval for biologics are exceptionally high, creating formidable barriers that prevent rapid market penetration by generic drugs.

4. The boundless possibilities for extended applications:

Current research has expanded into areas such as NASH (non-alcoholic steatohepatitis), cardiovascular disease, Alzheimer's disease, and sleep apnea. The approval of each new indication will inject fresh momentum into the product lifecycle.

V. The Future Is Here: The Vast Horizons of GLP-1

The story of GLP-1 is far from over. Current research continues to push its boundaries, advancing into major fields such as non-alcoholic steatohepatitis (NASH), cardiovascular disease, and Alzheimer's disease. If the future of GLP-1 is akin to exploring a vast and boundless “cosmic ocean,” then peptide synthesizers are the most crucial “starship helm” in our hands. Moving forward, GLP-1 research will transcend its traditional focus on glycemic control and weight management. It will advance toward more complex structures, personalized formulations, and synergistic combinations with other functional peptides. Throughout this journey, highly automated peptide synthesizers will serve as catalysts for accelerated innovation. They empower researchers to rapidly and precisely synthesize thousands of novel GLP-1 analogues, fine-tuning amino acid sequences to optimize efficacy, extend half-lives, or reduce side effects—efficiently identifying next-generation “best-in-class” therapies. From automated high-throughput screening to patient-specific personalized therapies, the unprecedented synthetic flexibility and precision offered by peptide synthesizers are propelling GLP-1's future beyond mass-produced “standardized drugs” into a new era of on-demand, precision-engineered “bio-intelligent drugs.” As a specialized manufacturer of peptide synthesizers, our company closely monitors cutting-edge developments in the GLP-1 field. We are actively positioning ourselves across innovation drug R&D, process optimization, critical raw materials, and delivery devices, committed to contributing our professional expertise to advance this field.

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