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Biological role of peptide in living cell: A review

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Abstract
Peptides and proteins are biologically important biomolecules important to all living systems. Mammals, including humans, use many peptide molecules as signaling hormones, and the role of proteins is important in cell structure and function. Peptides are derived from proteins, perform biological functions in all areas of life, and act as signaling agents involved in protein-protein interactions that are essential to all biological processes. Almost all human diseases are closely related to the function of peptides and proteins, and many peptides and proteins have been used for disease prevention and treatment. Despite the presence of more than 10,000 different proteins in human cells, the role of many peptides is still not fully understood. Even the most well-studied peptides and proteins still face various obstacles to their development as research tools and clinical drugs. This review focuses on the chemistry of peptides with their role in antibiotics and hormones, their use against bacteria, and their application as prophylactics. Limitations and challenges that limit the therapeutic application of peptides are highlighted.

Keywords: Amino acids, peptide, opioid peptide, solid phase synthesis, antibiotics

1. Introduction

Peptides are naturally occurring biomolecules, short chains of amino acids joined by peptide bonds. There are 20 naturally occurring amino acids, which when combined like letters are words, form a huge variety of different molecules. Peptides are called oligopeptides when their chain is less than 20 amino acids, including dipeptides, tripeptides, tetrapeptides, etc. Polypeptides are longer, continuous, unbranched chains of peptides. Polypeptides containing about 50 or more amino acids are called proteins. Peptides can be obtained naturally or synthetically and are composed of two or more amino acids joined by amide formation. A chemical bond (covalent bond) formed between the nitrogen atom of one amino acid and the carboxyl group of another amino acid. Peptides can be distinguished from proteins by the number of amino acids. Dipeptides are known as the shortest peptides and consist of two amino acids joined by a single bond known as a peptide bond. Peptides are often classified by function or synthesis. Peptides are found in all life on Earth and are intrinsically related to the origin of life. Synergistic interactions between peptides and other molecules such as amino acids, proteins, nucleic acids and lipids are driving forces at all stages of chemical evolution. Today, chemical-peptide synthetic biology approaches offer a theory about the evolution of life, especially in the eyes of scientists who believe that chemistry historically preceded biology [1-4].

Peptides are present in all living things and play an important role in all kinds of biological activities. Like proteins, peptides are naturally formed (synthesized) by transcription of sequences in the genetic code DNA. Transcription is the biological process of copying a specific her DNA gene sequence into a messenger molecule, mRNA, carrying the code for a specific peptide or protein. Chains of amino acids read from the mRNA are assembled into one her molecule by peptide bonds. In the human body, peptides are found in all cells and tissues and perform a variety of important functions. Maintaining proper concentration and activity levels of peptides is necessary to achieve homeostasis and maintain good health. They explore the 'middle space' between small chemical molecules and biologics based on molecular weight. They possess intermediate properties of conformation-independent elongation, and have the advantages of both small molecule drugs (e.g. enhanced permeability) and therapeutic proteins (selectivity, targeting potency), along with undesirable side effects and It has drawbacks such as drug interactions or membrane-impermeable [5, 6].

Classes of peptides
Peptides are commonly divided into several classes according to their source and function. These classes differ in how the peptides themselves are produced. For example, ribosomal peptides are produced from translation of mRNA. Ribosomal peptides often function as hormones and signaling molecules *in vivo*. These include tachykinin peptides, vasoactive intestinal peptides, opioid peptides, pancreatic peptides, and calcitonin peptides. Some groups of peptides include plant peptides, bacterial/antibiotic peptides, fungal peptides, invertebrate peptides, amphibian/skin peptides, venom peptides, cancer/anticancer peptides, vaccine peptides, immune/inflammatory peptides, brain Includes peptides, cardiovascular peptides, renal peptides, respiratory peptides, neurotropic Peptides, and blood brain peptides. Some ribosomal peptides undergo proteolysis. They function as hormones and signaling molecules, typically in higher organisms. Some microorganisms produce peptides as antibiotics, such as microcins and bacteriocins [7-9]. Peptones are small pieces of protein derived from animal milk or meat by hydrolysis with proteolytic enzymes. Peptones also include fats, metals, salts, vitamins, and many other biological compounds. It is used in nutrient media for the growth of bacteria and fungi [10, 11]. In contrast to ribosomal mediation, non-ribosomal peptides are enzymatically degraded [12, 13]. Glutathione, a component of the antioxidant defenses of most aerobic organisms. Other non-ribosomal peptides are found in unicellular organisms, plants and fungi and are synthesized by modular enzyme complexes called non-ribosomal peptide synthetases [14, 15].

Synthesis of peptides

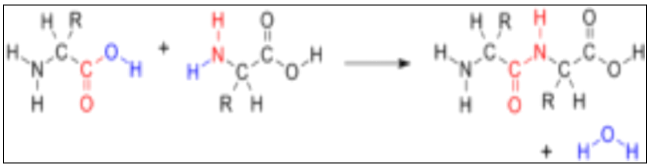

Fig 1: Diagrammatic representation of peptide synthesis

Peptides are formed naturally in the body and synthesized in the laboratory. The body organically produces several peptides such as enkephalins, vasopressins and opioid peptides. Peptide synthesis techniques based on chemical methods have been used in the past 100 years of history. T. Curtius (1881) synthesized the first of his N-protected dipeptides, benzoylglycylglycine, using the azide coupling method of treating the silver salt of glycine with benzoyl chloride. However, the first published synthetic dipeptide, Gly-Gly, was synthesized by Emil Fischer in 1901 by hydrolysis of glycine diketopiperazines and is considered the beginning of peptide chemistry [16, 17], where amino protecting groups are Developed. Then the carbobenzoxy (Cbz) group was introduced, followed by he tert-butyloxycarbonyl (Boc) group [18, 19]. Solid-phase peptide synthesis (SPPS) was introduced to synthesize peptide sequences using solid resins and to otherwise improve peptide synthesis [20-23].

The biological and physiological role of peptides
The function that a peptide performs depends on the type and sequence of amino acids in the chain and the specific form of the peptide. Peptides often act as hormones and are therefore biological messengers that carry information from one tissue to another through the blood. Her two general classes of hormones are peptide hormones and steroid hormones. Peptide hormones are produced by glands and many tissues such as the stomach, intestines, and brain. Examples of peptide hormones are hormones involved in blood sugar regulation such as insulin, glucagon-like peptide 1 (GLP-1), and glucagon, and appetite-regulating hormones such as ghrelin. For a peptide to be effective, it must bind to its specific receptor located on the membrane of the relevant cell. Receptors span the cell membrane and consist of an extracellular domain to which the peptide binds and an intracellular domain that functions when the peptide binds and activates the receptor. An example is the GLP-1 receptor found on pancreatic beta cells. Activation of the receptor by natural GLP-1 or peptide analogues (synthetic molecules that mimic the action of natural his GLP-1 such as our lixisenatide) stimulates a series of biological events to the cell. Release insulin. Due to their function, peptides are called neuropeptides, peptides that work in conjunction with nerve tissue. Lipopeptides are associated with lipids and pepducins are lipopeptides that interact with GPCRs. Peptide hormones are peptides that function as hormones. Proteose is a mixture of peptides produced by protein hydrolysis [24, 25]. Peptide drugs are chemicals designed to directly modulate the peptide system in the body or brain. A cell-penetrating peptide is a peptide able to penetrate the cell membrane [26].

Conclusions
The field of peptide science is growing and this tremendous progress demonstrates the importance of peptides and proteins as therapeutic agents. Short peptides exhibit an amazing variety of biological functions that can be exploited by innovative therapeutics in nearly every field of medicine. They are synthesized and studied by research groups distributed around the world. Peptides, which are fragments of proteins, have become attractive pharmaceuticals with almost unlimited potential, and further development is awaited in the near future. The growth of peptides as therapeutic agents is receiving increasing attention from pharmaceutical companies. Advantages of peptides as drugs include their specificity, potency, activity, and low toxicity. Chemical synthesis, especially SPPS based on Fmoc chemistry, is currently the most popular choice for peptide manufacturing processes.

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