REVIEW
Application of Enzyme Engineering in Pharmacy

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ABSTRACT

Enzyme engineering is an important part of modern biotechnology. Due to its high reaction specificity, high efficiency, mild reaction conditions, and low pollution, it is also an important method widely used in the pharmaceutical field. The application of enzymes in medicine is diverse, such as: diagnosis, prevention and treatment of diseases with enzymes, manufacture of various drugs with enzymes, etc., mainly through manual operations, to obtain enzymes required by the pharmaceutical industry, and through various means Enzymes perform their catalytic functions. This article mainly introduces the application of enzyme engineering in the pharmaceutical field, and also prospects the development trend of enzyme engineering in the pharmaceutical field.

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Application

1. Introduction

Enzyme engineering is to use the biocatalytic function of enzymes in a certain reaction device, such as enzymes and enzyme-containing cells (animals, plants, microorganisms), and use engineering means to convert the corresponding raw materials into useful substances and apply them. A science in social life, including the preparation of enzyme preparations, immobilization of enzymes, modification and transformation of enzymes, and enzyme reactors. It is widely used in the food industry, pharmaceutical industry, and light industry. In large-scale production, microorganisms are generally used as the main source of enzymes. This article mainly introduces the application of enzyme engineering in the pharmaceutical field.

2. Application of Enzymes in the Pharmaceutical Field

The technology of enzyme production and application is called enzyme engineering. Its main task is to obtain a large number of required enzymes through manual operation through pre-design, and use various methods to make the enzyme exert its maximum catalytic function. Enzyme engineering mainly studies drug-producing enzymes in pharmaceuticals. Nowadays, drug-producing enzymes are used more and more in drug manufacturing. Many drugs are produced by enzymatic methods using drug-producing enzymes, that is, using enzyme catalysis The effect converts the precursor substance into a drug.
3. The Application of Enzyme Engineering in the Extraction of Effective Components of Traditional Chinese Medicine

Because the ingredients in traditional Chinese medicine are complex and the effective ingredients are often not high, the extraction and separation efficiency of the effective ingredients using traditional methods is not high, so enzyme engineering pharmaceuticals have become a better choice.

The extraction of active ingredients of Chinese medicine takes advantage of the specificity of enzymes. The selection of appropriate enzymes can remove impurities such as starch, protein, pectin and other components that affect liquid preparations without high temperature, and decompose plant tissues more gently to accelerate the effective ingredients Release extraction can also promote the conversion of some poorly water-soluble components into water-soluble components such as sugar, which is conducive to extraction and has specific biocatalytic activity. Greatly improve the extraction rate and efficiency of the effective ingredients of Chinese medicine.

Honeysuckle is treated with cellulase and pectinase separately or in combination before extracting with ethanol reflux. The results show that the cellulase treatment can significantly increase the yield of chlorogenic acid in honeysuckle extract (8.15g/100g), the optimum temperature is 40-50℃, and the enzyme dosage and treatment time have a significant impact on the yield of chlorogenic acid; The combined treatment has no obvious effect on the yield of chlorogenic acid, but it can significantly increase the yield of the extract.

In order to improve the extraction rate of the effective components of Astragalus, under the conditions of pH 4.5-6.0 and temperature of 40-60℃, 0.3%, 0.4% and 0.5% cellulase were pretreated in advance in regular water respectively. The results showed that after pretreatment with different concentrations of cellulase, the yields of astragalus polysaccharides were all increased by more than 3 times compared with the water extraction method, and the yields of astragaloside IV were all 1.5 times that of the water extraction method.

The effective ingredients of medicinal plants are derived from secondary metabolites of plants. Nowadays, many countries have fully applied immobilized cells and immobilized enzymes for drug production. Many countries have made full use of immobilized and immobilized enzymes for drug production.

(1) Used for the refining of drugs
In the biopharmaceutical process, drugs often contain impurities such as protein, starch, pectin, etc. Using conventional extraction methods, the impurities in the drug are difficult to separate and easily affect the effective ingredients of the drug. Therefore, the use of enzyme engineering for extraction is a good choice. The essential role of enzymes is to catalyze. Enzymes will not be consumed when participating in biochemical reactions, and will retain their original properties, so it will not affect the rate of biochemical reactions. Corresponding enzymes can be used to decompose or remove impurities. For example, when the polysaccharide and protein components in sea cucumbers are extracted by alkali extraction, the polysaccharide yield is only 0.06% of that of fresh sea cucumbers. The polysaccharides of sea cucumbers extracted with gastric pancreatic enzyme are 1.45% to 1.61% of that of fresh sea cucumbers.

The method of using enzyme engineering pharmacy can solve the above-mentioned problems, and at the same time can improve the purity of the medicine and the quality of the finished product.

(2) Used in the production of antibiotics
Enzymatic pharmaceuticals are also widely used in the production of antibiotics. Nowadays, many drugs, including some valuable drugs, are produced by enzyme engineering. Such as penicillin acylase to produce semi-synthetic antibiotics.

Different sources of penicillin acylase have different requirements for temperature and pH. Penicillin acylase from the same source requires different conditions when catalyzing the hydrolysis reaction and catalyzing the synthesis reaction, especially the pH conditions are quite different during operation. Be in control. Generally speaking, when catalytic hydrolysis reaction, the pH is 7.0–8.0, and when catalytic synthesis reaction, the pH is reduced to 5.0–7.0.

When catalyzing the synthesis reaction, in addition to controlling the pH, temperature and enzyme concentration, attention should also be paid to the ratio of 6-APA (or 7-ACA) to the side chain carboxylic acid derivative (R-COOH) in the reaction solution. Although the theoretical ratio is 1:1, in actual production, in order to increase the yield and conversion rate, the 6-APA (or 7-ACA): R-COOH in the reaction solution is preferably 1.2–1.4. Appropriate addition of some surfactants or isobutanol to the reaction solution can help increase its conversion rate.

(3) It is directly applied to the prevention and treatment of diseases
Enzymes can also be used as drugs to directly treat many diseases. The enzymes used as drugs to prevent and treat diseases are called medicinal enzymes. Medicinal enzymes are used more and more widely because of their remarkable curative effect and small side effects. Commonly used medicinal enzymes are protease, lysozyme, superoxide dismutase (SOD) and so on. Proteases are a class of enzymes that catalyze the hydrolysis of proteins. Protease can be used to treat a variety of diseases. It is one of the earliest...
and most widely used medicinal enzymes in clinical use. The proteases commonly used in the treatment of indigestion and anti-inflammatory diseases mainly include trypsin, pepsin, chymotrypsin, and papaya. Protease, bromelain, etc. Lysozyme is also a widely used medicinal enzyme with antibacterial, anti-inflammatory and analgesic effects. Lysozyme is mainly isolated from egg white, plants and microorganisms. Lysozyme acts on the cell wall of bacteria to dissolve and kill pathogenic bacteria and spoilage bacteria. Bacteria that are resistant to antibiotics also have a lytic effect, which has significant curative effect.

The human body has few side effects and is an ideal medicinal enzyme. When lysozyme is used together with antibiotics, it can also significantly improve the efficacy of antibiotics. Superoxide dismutase (SOD) is an oxidoreductase that catalyzes the redox reaction of superoxide anions to generate oxygen and near hydrogen oxide. It is mainly extracted and isolated from animal blood, garlic, green plum and other plants, and can also be obtained through microbial fermentation. SOD has anti-oxidation, anti-aging and anti-radiation effects. It has a significant effect on diseases such as lupus erythematosus, dermatomyositis, colitis, and oxygen poisoning. Although SOD has poor stability in the body, its stability can be greatly increased by modification of enzyme molecules, creating conditions for the use of SOD.

Modern enzyme engineering has the advantages of advanced technology, low investment in plant equipment, simple process, low energy consumption, high product yield, high efficiency, high efficiency and low pollution, and it is increasingly becoming the main force in the application of chemical and pharmaceutical industries. In the past, drugs produced by traditional techniques such as chemical synthesis, microbial fermentation and biological material extraction can be produced through modern enzyme engineering, and even expensive drugs that are impossible to obtain with traditional techniques, such as human insulin and McARb, can be obtained.

4. Summary and Outlook

The development of enzyme engineering occupies an important position in the development of bioengineering sciences. Biological sciences and bioengineering in the 21st century will play an important role in the development of the world's science and technology economy, and enzyme engineering as an important part of it will also develop rapidly. Broad prospects. In addition to using commonly used technologies, with the latest knowledge of genomics and proteomics, with the help of DNA rearrangement and phage surface display technology, the research and development of new enzymes are carried out to give full play to the catalytic function of enzymes, expand the application scope of enzymes, and improve enzymes. The application efficiency of the enzyme is the main goal of the application research of enzyme engineering. Immobilization, molecular modification and non-aqueous phase catalysis should be adopted to realize the efficient application of enzymes.

With the deepening of research on enzyme engineering, enzymes will continue to be used in all aspects of the pharmaceutical field. The production of drugs by enzyme engineering has the advantages of mild reaction, high efficiency, and low pollution, and has obvious advantages in the pharmaceutical field. At present, the extraction and application technology level of animal and plant enzymes needs to be improved. Therefore, enzymes from microorganisms are mainly used in the process of enzyme engineering pharmacy. Nowadays, the level of enzyme engineering technology in China is developing rapidly. The rational application of enzyme engineering technology can greatly improve the development of the pharmaceutical manufacturing industry. In the future, the application of enzymes in the pharmaceutical field will also increase, and enzyme engineering will play a greater role in the pharmaceutical field.

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