

## Part II

# Natural Small Molecule Drugs for the Prevention and Treatment of Neuropsychiatric Diseases

### Overview

In the long history of human understanding natural drugs, the discovery of drugs that act on the nervous system is a unique process. Most of the drugs were originally used as poisons, which was the main basis for people recognizing the close relationship between drugs and toxicity. In the long process of human struggling against nature, especially for the hunting race, in order to better capture the ferocious wild animals, they found the substances with neurotoxicity. The toxicities of these substances were very significant and strong, therefore attracting people's attention. After a series of studies, a number of natural small molecule drugs with selective toxicity were discovered, such as tubocurarine, cissampelosine methiodide, pilocarpine, physostigmine, and so on.

In order to demonstrate the toxic characteristics and rules of these toxic small molecule drugs, scientists have carried out systematic and in-depth studies of their action mechanisms; discovered the roles of neural signal transduction, agonism, and antagonism on receptors; and greatly promoted the development of neuroscience. We are now able to understand the mechanism of neural signal transduction at the molecular level, which is closely related to the action mechanisms of these drugs. For these drugs, their toxic, pharmacological, and physiological effects are the quantitative change process of the same action. Their actions increase with the increase of dosage, and they appear toxic when their doses reach a certain level. Therefore, a suitable dose is a good medicine for disease, and the overdose is a fatal poison.

Many natural small molecule drugs have been discovered, which act on the nervous system; some of them act on the cholinergic nervous system, such as cholinergic receptor agonists, antagonists, and cholinesterase inhibitors. Among these natural small molecule drugs, some of which mainly show peripheral action and some of which mainly show central action, they have played active roles in the treatment of many diseases, such as galantamine, huperzine A, and so on. In addition,

there are several drugs that act on other nervous systems, such as ephedrine, which acts on the adrenergic nervous system, and caffeine, a central stimulant.

In the study of anticholinergic drugs, the study of the natural cholinergic M receptor antagonists also led to favorable effects in the clinical treatment of acute diseases, such as shock. It is worth mentioning that the study of scopolamine and its derivatives promoted the study of microcirculation and therefore effectively improved the treatment effects of the acute diseases caused by microcirculation disorders. Based on the studies of the natural products scopolamine and so on, the development of the drug "654-2" has rescued a large number of critical patients, and now it is still an important drug for clinical emergency treatment.

The pharmacological study of ephedrine is a major discovery by Chinese scholars in the study of traditional medicines. In the 1920s, the pharmacologists demonstrated that ephedrine induced smooth muscle relaxation after the experiments. This discovery not only provides a new drug for the treatment of diseases, but the mechanism study also made progress, which better confirms the effectiveness and material basis of Chinese medicine in treating diseases.

In the natural drugs that act on the nervous system, there is a particular drug, opium. Opium is a natural drug with strong analgesic effect, used for the treatment of many diseases. Because of its addiction, it has brought great disaster to mankind in the process of its long-term use. So far, opium, as a starting point, has not only promoted the human understanding of central analgesic mechanism, and the discovery of the opioid receptor, but also promoted the discovery of various analgesic medicines, cough medicines and so on. At the same time, due to the use of opioid, a number of addictive drugs appeared. Opium, as a drug, fully performs the dual natures of drugs with therapeutic and toxic effects. Its effect is remarkable in relieving human suffering, and its evil is also extremely serious in misuse.

Among the small molecule drugs discovered and used for the treatment of neuropsychiatric system, some of which have been clinically proven to have very limited therapeutic efficacy, and their alternative drugs with better efficacy have been developed. So this kind of drugs should be evaluated objectively and withdrawn from the clinic according to specific conditions. There are also many medicines with the features of being effective and safe. Although these drugs were ever used in clinical, other chemical drugs developed later with some special characteristics, especially with more clear mechanism, gradually replaced these drugs. These early discovered drugs, such as rotundine, strychnine, chelidonine, and so on, need more in-depth studies to comprehensively understand their characteristics and rules. We hope these natural medicines will play greater roles in the prevention and treatment of nervous system diseases.