INTRODUCTION

Bulbus Lilii is the fleshy bulb scale of *Lilium brownii* F.E. Brown var. viridulum Baker in the family Liliaceae. It is sweet in taste, cold in nature and is used for deficiency of yin, irritating dry cough, overstrain cough, hemoptysis, dysphoria, palpitation, insomnia, dreaminess, absent-mindedness, etc. It works especially well for tuberculosis, as well as nourishment and relief of bronchitis and is thus reputed as a "good vegetable and medicine". Bulbus Lilii is used for dreaminess, absent-mindedness. The extraction of polysaccharide and saponin constituents in Bulbus Lilii have been extensively studied, but relatively little attention has been paid to the process. The objective of the study is to investigate the extraction process of saponins from Bulbus Lilii and their antidepressant effects in mice. Orthogonal experiment was used to optimize the concentration and amount of the extraction solvent, as well as the extraction time of Bulbus Lilii saponins, meanwhile, immobility time of mice in the tail suspension and forced swimming tests and antagonism of reserpine-induced hypothermia were observed. As results optimal process for the extraction of saponins from Bulbus Lilii was 1 time heat reflux extraction with 70 % ethanol for 3 h; compared with the control group, each Bulbus Lilii saponin experimental group could significantly shorten the immobility time of mice in the tail suspension and forced swimming tests and could effectively antagonize reserpine-induced hypothermia in mice as well. It is concluded that Bulbus Lilii saponins have antidepressant effects.

Keywords: Bulbus Lilii saponins, Orthogonal experiment, Forced swimming.
Saponin content was determined by spectrophotometry with diosgenin as the reference substance based on the vanillin-perchloric acid chromogenic reaction of steroidal saponin compounds and the extraction yield of total saponins of Bulbus Lilii was calculated.

Study on antidepressant activity of Bulbus Lilii saponins

Animal grouping and administration: The mice were randomized into five groups, namely the blank control group (distilled water), lily saponin low-, medium- and high-dose groups (50, 100 and 150 mg/kg) and fluoxetine group (20 mg/kg), administration volume was all 0.2 mL/kg. The mice in each group were intragastrically administered once daily at 8 a.m. morning for 7 consecutive days.

Tail suspension test in mice: By Steru et al. procedure, 7 d after administration, the mice were suspended in the tail suspension device upside down and the sight of adjacent mouse was blocked by a board. Cumulative immobility time of mice in the treatment groups and control group within 6 min were recorded.

Forced swimming test in mice: Referring to Porsolt et al. method, 90 min after the last administration, the mice were placed in a 20 cm diameter bucket filled with water to a depth of 15 cm and maintained at 25 °C. After a period of time, activity of mice decreased due to despair, preconditioning time was 2 min and the immobility time within the last 5 min was recorded.

Reserpine reversal test: Referring to Askew et al. method, 4 mg/kg reserpine was intraperitoneally injected to the mice at the last administration, after 2 h, rectal temperature was measured and differences in the change of rectal temperature between treatment groups, control group and normal control group were compared.

RESULTS AND DISCUSSION

As can be seen from the experimental results in Table-2, the range (R) value of influencing factors differed from each other, their sizes in proper order were, the order of factors influencing total saponins was B > A > C and the optimal extraction conditions were obtained as B: A: C: i.e. 1 time heat reflux extraction with 70% ethanol for 3 h.

Tail suspension test: The immobility state presented in the tail suspension model of mice also reflects the despair behavior of animals, different dose groups of Bulbus Lilii saponins could significantly shorten the immobility time of mice in the tail suspension test in a dose dependent manner, Fig. 1.
The medicinal value of Bulbus Lilii has been recognized very early in China. China’s classic "Shen Nong’s Herbal Classic" recorded that "Bulbus Lilii, sweet in taste and neutral in nature, treats pathogenic qi, abdominal distension and cardiodynia, can induce diuresis, relax the bowels, tonify middle-jiao and qi, grows in the mountains and valleys." As a representative both medicinal and edible plant, physicians and scholars through the ages have done abundant researches on the efficacy and clinical applications of Bulbus Lilii. In this paper, extraction process of saponins from Bulbus Lilii was optimized, the results showed that: 1 time heat reflux extraction with 70 % ethanol for 3 h could effectively improve the extraction yield of *Lilium brownii* saponins and reduce their losses.

Depression is a mental disorder, which is basically characterized by persistent emotional downturn. It is often accompanied by slow behaviour, mental retardation and a variety of somatic symptoms. The cause of depression is relatively complex, despite the extensive researches done by Chinese and foreign scholars, its pathogenesis and mechanism are yet not clear. In terms of possible pathogenic causes, depression is generally divided into primary depression and secondary depression.

In 1958, Kline for the first time gave the depressed patients iproniazid, which showed a good antidepressant effect; since then, the era of treatment of depressive illness using chemical drugs begin11. Researchers at China and abroad have researched and developed various categories of drugs such as tricyclic antidepressants (TCAs), heterocyclic antidepressants (HCAs), novel reversible monoamine oxidase inhibitors (RIMAs), selective 5-serotonin reuptake inhibitors (SSRIs), selective norepinephrine reuptake inhibitors (NaRIs), 5-serotonin and norepinephrine reuptake inhibitors (SNaRIs), as well as norenergic and specific 5-serotonergic antidepressants (NaSSAs) for the diagnosis and treatment of depressive illness11.

According to statistics, in 2000, annual sales of antidepressants reached $13.4 billion, accounting for 4.2 % of the global share of sales, ranking No. 3; sales growth rate was 18 %, ranking No. 5.

While the antidepressants have stepped into the golden period of development, we must see that a variety of adverse reactions caused by taking antidepressants have seriously affected and restricted its development, for example, TCAs cause cardiac toxicity such as postural hypotension, arrhythmia, atrioventricular block, heart failure, myocardial infarction; patients taking SSRIs have adverse reactions such as insomnia, impotence, nausea, constipation, hyperhidrosis, dry mouth, fatigue, drowsiness, etc., the search of Chinese medicines and natural medicines which have effective antidepressant effects with small toxic and side effects has become the focus of researches on antidepressant diseases.

This experimental results showed that compared with the control group, each Bulbus Lilii saponin experimental group could all significantly shorten the immobility time of mice in the tail suspension test and forced swimming test and could effectively antagonize reserpine-induced hypothermia in mice as well, preliminarily demonstrating the inhibitor effect of Bulbus Lilii saponins on depressive illness in mice, its mechanism of action required more studies.

**REFERENCES**