Ban Lan Gen (Radix Isatidis)  板蓝根

You-Ping Zhu 朱友平 (The Netherlands)

During last year’s SARS outbreak in China, Ban Lan Gen was widely used by the general public to ward off SARS. However, scientific study to verify such effect is lacking as SARS is a newly discovered disease. The connection is made mainly because Ban Lan Gen has antiviral activities and has been used for other respiratory diseases. In traditional Chinese medicine, Ban Lan Gen is used in combination with other herbs to treat the common cold, sore throat, mumps, respiratory ailments, other febrile diseases and malignant tumors.

The most popular and widely used herbal product made from this herb is Banlangen Chongji, which is one of the most commonly used OTC drugs for flu in China. Banlangen Chongji contains the water extract of the roots of Isatis indigotica as the active ingredient.

The following monograph provides the most up-to-date scientific evidence available so far.

SOURCE PLANT
Ban Lan Gen consists of the dried roots of Isatis indigotica Fort. (Cruciferae). The herb is mainly produced in the Chinese provinces of Hebei, Jiangsu and Anhui. The roots are collected in the autumn and then dried in the sun.

The tetraploid plants of Isatis indigotica have higher contents of anti-endotoxic organic acids and stronger pharmacological activities than the diploid parent.

CHEMISTRY
The roots of I. indigotica contain indigo, indirubin, adenoside, β- and γ-sitosoterol, several amino acids and two sulfur-containing compounds epigoitrin and 2-hydroxy-3-butenyl thiocyanate.

Recently, a new alkaloid (E)-3-(3’,5’-dimethoxy-4’-hydroxybenzylidene)-2-indolinone together with 2,3-dihydro-1H-pyrrolo[2,1-c][1,4]benzo-diazepine-5,11(10H,11aH)-dione, 2-(4-hydroxy-3-methoxyphenyl)-4-(4-hydroxy-3-methoxy-phenyl)-methyl]-3-hydroxymethyl-tetrahydro-furan, and 2-methoxy-4-[(tetrahydro-4’-[(4-hydroxy-3-methoxy-phenyl)-methyl]-3-hydroxymethyl-2-furanyl]-phenyl-1-O-β-D-glucopyranoside were also isolated from the root.

Three more compounds were isolated from the tetraploid plant of Isatis indigotica. They were (E)-2-[(3’-indole) cyanomethylene]-3-indolinone, 2-[(4-hydroxy-3-methoxyphenyl)-4-[(4-hydroxy-3-methoxy-phenyl)-methyl]-3-hydroxymethyl-tetrahydro-furan, and 2-methoxy-4-[(tetrahydro-4’-[(4-hydroxy-3-methoxy-phenyl)-methyl]-3-hydroxymethyl-2-furanyl]-phenyl-1-O-β-D-glucopyranoside.

PHARMACOLOGY

Antiviral activity
The 50% injection solution of the root of Isatis indigotica significantly inhibited influenza virus strains PR8 and JK68-1 both in vitro and in chicken embryo test. In the monolayer primary tissue culture of human embryonic renal cells, the 100% decoction of the root delayed cellular pathogenic changes caused by influenza virus JK68-1 and adenovirus-79.

Immunomodulatory activity
Polysaccharides (IIP) extracted from the root of Isatis indigotica significantly increased the weight of the spleen and number of white blood cells and lymphocytes in peripheral blood in mice, and antagonized the immunosuppressive actions of hydrocortisone. It also increased the delayed hypersensitivity reaction induced by 2, 4-dinitrochlorobenzene in normal
mice and in immuno-depressed mice by cyclophosphamide. In addition, the plaque forming cells in plenocytes of mice treated with IIP were higher than that of the control group. IIP also elevated the clearance rate of intravenous charcoal particles in normal mice, i.e., stimulated the phagocytic activity of macrophages10.

At non-cytotoxic concentrations, the main active constituent of the herb indirubin was found to reduce both the expression and production of RANTES (regulated on activation, normal T cell expressed and secreted) in influenza-infected cells. Indirubin-3′-oxime, a derivative of indirubin, also mediated a potent inhibitory effect on the expression of RANTES. The influenza virus infection-induced phosphorylation of the nuclear transcription NF-κB regulatory molecule IkBalpha and the p38 MAP kinase were also inhibited by indirubin-3′-oxime. This finding suggests that indirubin is a component with immunomodulatory activity on the expression of RANTES11.

**Antibacterial activity**
The decoction or aqueous extract of the root inhibited the growth of bacteria Staphylococcus aureus, Diplococcus pneumoniae, alpha streptococcus, Hemophilus influenzae, Escherichia coli, Salmonella typhi and Shigella dysenteriae9.

**Antinociceptive and anti-inflammatory activities**
The methanolic extract of Isatis indigotica root significantly and dose-dependently inhibited the writhing responses of mice and decreased the licking time in both the early and late phases of the formalin test. It also reduced the paw edema induced by carrageenan in rats. In addition, it potently attenuated pyrexia induced by lipopolysaccharide12.

The alkaloid isaindigotone, isolated from the root of Isatis indigotica, was found to be a scavenger of superoxide generated either by the hypoxanthine/xanthine oxidase system or stimulated human neutrophils. Isaindigotone and its acetylated derivative also inhibited 5-lipoxygenase activity and leukotriene B4 production in these cells. In RAW 264.7 macrophages stimulated with lipopolysaccharide, synthetic derivatives exerted higher inhibitory effects on PGE2 and nitric oxide (NO) generation when compared with (1a). The presence of an acetoxyl group at C-4′ favors the inhibition of NO and PGE2 production, whereas the fluoro substituent at C-4′ or the absence of substituents on the aromatic ring of the benzylidene unit improves the inhibition of PGE2. Thus, this series of compounds can attenuate the production of mediators relevant to the inflammatory response13.

**Anti-endotoxic activity**
In the limulus amebocyte lysate (LAL) test, 3-(2’-carboxyphenyl)-4(3H)-quinazolinone, 2-aminobenzoic acid, syringic acid, benzoic acid and salicylic acid exhibited significant antiendotoxic activities7.

Pretreatment of syringic acid was found to destroy 83% of the endotoxin in the Limulus test and markedly reduced the fever induced by endotoxin in rabbits. Furthermore, LPS-induced death in mice was dropped from 68% to 20% in mice pretreated with syringic acid14.

**FUNCTIONS AND APPLICATIONS**

**TCM functions**
Ban Lan Gen has a bitter taste and a cold property, acting on the heart and stomach channels. It has the functions of removing toxic heat, reducing heat in the blood and soothing the sore throat. It is thus indicated for eruptive epidemic diseases with dark red or purplish tongue, mumps, pharyngitis, laryngitis, scarlet fever, erysipelas and carbuncles.

**Applications**
The herb was effective in the treatment of hepatitis, mumps, influenza, infectious mononucleosis, viral skin diseases such as herpes simplex, herpes zoster and pityriasis rosea, epidemic cerebrospinal meningitis, and diphtheria.

**DOSAGE**
9 - 15 g.

**ADVERSE REACTIONS**
There are no known side effects or toxicity reported relating to the consumption of Ban Lan Gen.

**HERB-DRUG INTERACTIONS**
A male aged 65 with 25 years history of hypertension had been using daily doses of 25 mg×3 of Captopril and 10 mg×3 of Nitrendipine to manage the blood pressure about 130/75 mmHg. The patient took Banlangen Chongji for flu while concurrently on Captopril and Nitrendipine. After 4 consecutive days of administration of Banlangen Chongji, he began to feel dizziness and fatigue, and the blood pressure was raised to 165/95 mmHg. The blood pressure of the patient was lowered to 165/95 mmHg. The blood pressure of the patient was lowered to 135/75 mmHg one day after he discontinued using Banlangen Chongji, indicating that Banlangen Chongji may counteract the hypotensive actions of Captopril and Nitrendipine. Reusing one day dose of Banlangen Chongji caused the same reactions, reconfirming the antagonistic action of Banlangen Chongji against Captopril and Nitrendipine15.
REFERENCES


15. Mao WW, Gou QF, Wang XQ. Ban Lan Gen granules antagonize the actions of blood pressure lowering drugs Captopril and Nifedipine. Modern Pharmacy Practice (China), 2001; no. 2